

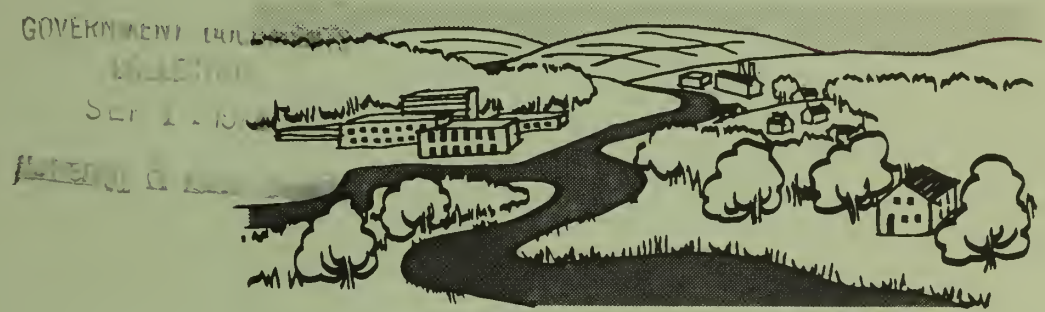
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DRAFT AREAWIDE

WASTE TREATMENT MANAGEMENT PLAN

for the Metropolitan Boston Area



Submitted in fulfillment of
Section 208 of the Federal
Water Pollution Control Act
Amendments of 1972

Metropolitan Area Planning Council

Part 1 - Volume III

NORTH AND SOUTH RIVERS - BASIN OVERVIEW

A. A PROFILE OF THE NORTH AND SOUTH RIVERS BASIN

Located to the south of Boston and lying in the southeast quadrant of the MAPC 208 study area, the North and South Rivers Basin encompasses the towns of Duxbury, Hanover, Marshfield, Norwell, Rockland and Scituate.

Three other towns also lie partially within the natural drainage area of the North and South Rivers. These are Abington, Hanson and Pembroke. These towns are in the Old Colony Planning Commission's 208 study area however, and are not included in this document.

The basin can be generally characterized as a rapidly growing, affluent group of communities undergoing highly land-intensive, suburban development, chiefly for low-density, residential use. It has been and will continue to be the fastest growing area in Southeast New England with a current population of 85,200.

Between 1950 and 1975 the population of the basin more than tripled. According to projections contained in this report, an additional increase in population of 52 percent is projected by 1995, to 111,300.

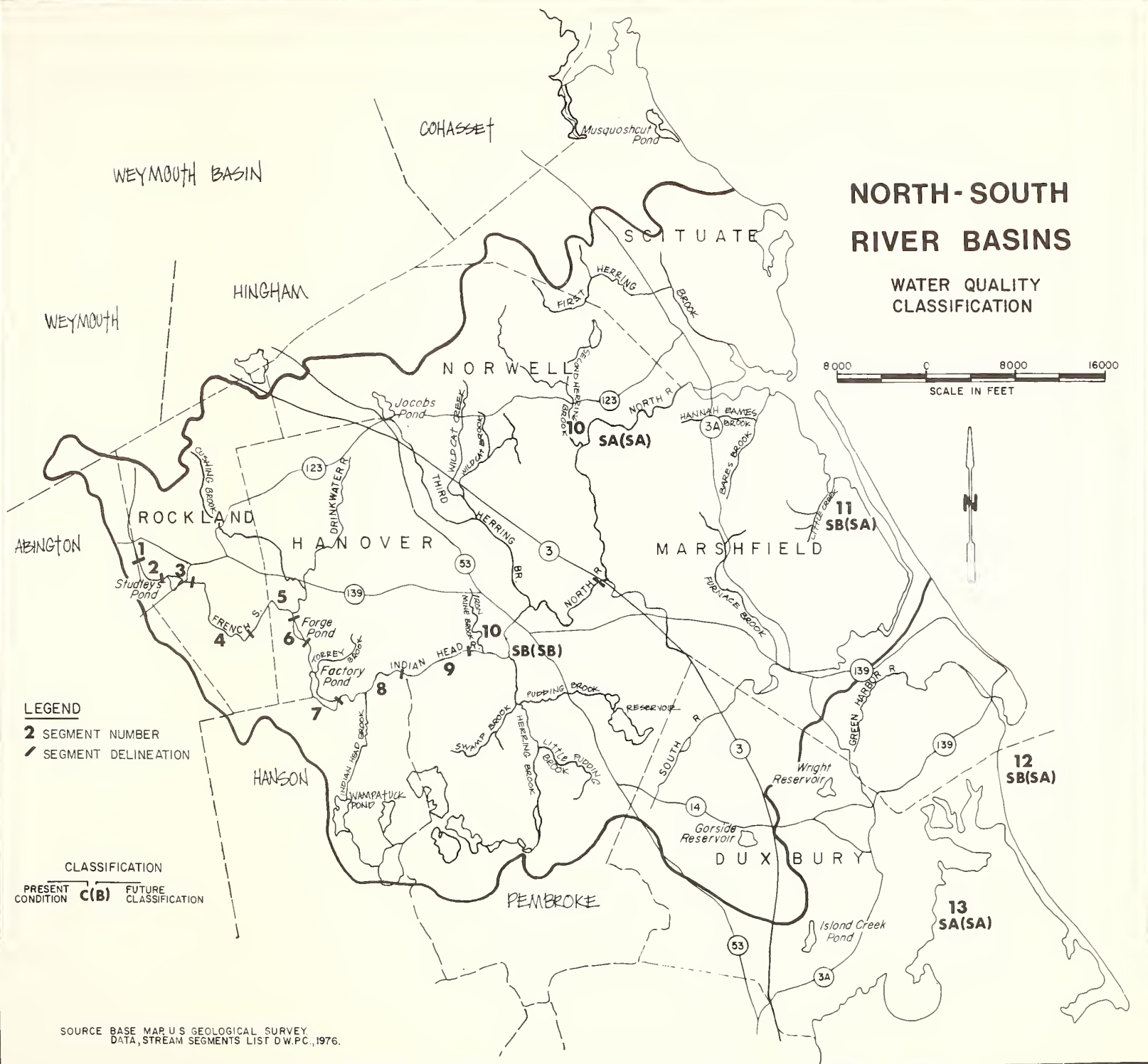
The proximity of basin towns to Route 3, a major artery linking Boston with Cape Cod, has further enhanced the area's attraction as a highly desirable suburban setting. In general, residence in the North and South Rivers Basin affords home ownership with the amenities of country and water-oriented living, together with easy access to regional employment and cultural centers.

Marshfield is the basin's most rapidly growing community with a population which has more than quadrupled between 1950 and 1970, from 3,267 to 15,223. Projections indicate that this population growth will continue, although at a lower rate. Population will be doubling during the next 20 years.

Economic growth in the basin is expected to continue in almost all sectors, particularly in trade and other service-oriented activities. There will be a 70 percent increase in total employment, representing some 11,300 new workers by 1995 according to report findings.

Manufacturing employment presently accounts for 16.1 percent of total employment and is expected to increase by 54 percent, or 1,420 employees, by 1995. Three-quarters of the new jobs will be in the dry manufacturing sector, while those remaining will be concerned with water-intensive manufacturing processes.

Land-use data indicates that housing construction has consisted mainly of single-family housing units on lots of roughly one acre. Multi-family housing construction has been minimal by comparison, although Rockland, and to some extent Marshfield, have more multi-family housing than other basin communities. (In Rockland, most are two-family houses.) Commercial development has occurred mainly in "strip" fashion along major arterials, especially at intersections. The basin has one major shopping center, Hanover Mall. Industrial acreage is limited, presently accounting for one percent of total acreage.



SOURCE: BASE MAP: U.S. GEOLOGICAL SURVEY
DATA: STREAM SEGMENTS LIST D.W.P.C., 1976.

CHANGES IN COMMUNITY POPULATIONS AND PROJECTIONS: NORTH-SOUTH BASIN

AREA	1950 ¹	1960 ¹	% Δ '50 '60	1970 ²	% Δ '60 '70	% Δ '50 '70	1975 ³	1980 ⁴	1985 ⁴	1990 ⁴	1995 ⁴	'70-'95 Δ
DUXBURY	3,167	4,727	49.3	7,635	61.5	141.1	10,600	12,400	13,500	14,300	14,700	92.5
HANOVER	3,389	5,923	74.8	10,107	70.6	198.2	10,600	11,000	11,400	11,800	12,200	20.7
MARSHFIELD	3,267	6,748	106.6	15,223	125.6	366.0	19,500	23,700	27,300	30,500	32,500	113.5
NORWELL	2,515	5,207	107.0	7,796	49.7	210.0	9,000	9,500	10,000	10,200	10,400	33.4
ROCKLAND	8,960	13,119	46.4	15,674	19.5	74.8	17,000	18,000	18,500	19,500	20,000	27.6
SCITUATE	5,993	11,214	87.1	16,973	51.4	183.2	17,800	19,000	20,000	20,900	21,500	26.7
TOTAL	27,291	46,938	72.0	73,409	56.4	169.0	85,200	93,600	100,700	107,200	111,300	51.7

1 U.S. Census of Population

2 U.S. Census of Housing

3 State Census

4 CTPS Projections



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Natural Environment

With a few notable exceptions discussed later in this chapter, the North and South Rivers presently exhibit water of high quality and are characterized as coastal tidal streams. Meandering through extensive salt marshes through most of their length, the rivers meet the ocean at a common mouth in tidal marsh and sand dunes at Scituate.

The watershed of the North and South Rivers encompasses approximately 75,000 acres. Nearly 60 percent is covered by some form of woodland. Another seven percent is comprised of either coastal or inland wetlands. These important natural areas act as filters and retainers of potential water contaminants.

From an aesthetic viewpoint, the North and South Rivers provide outstanding landscape characteristics, particularly in the tidal estuaries. The coastal areas of saltmarsh around Green Harbor in Marshfield and in Duxbury are also outstanding, as are long expanses of sand and shingle barrier beaches.

Wastewater Disposal

The treatment of domestic wastewater in the North/South Basin is accomplished primarily through the use of sub-surface disposal systems - septic systems. These systems treat and dispose of about 88 percent of the total volumes of domestic wastewater generated in the basin. The remainder is collected and treated at sewage treatment facilities located in Marshfield, Rockland and Scituate. These communities are also presently in the midst of plans to expand and upgrade their existing treatment facilities and collection systems. Duxbury Beach is included in Marshfield's program. Duxbury, Hanover and Norwell do not have existing municipal collection systems or treatment facilities.

Given the rate of anticipated population growth and corresponding development for the next 20 years, it is important to note that, in general terms, local soils exhibit moderate to severe limitations for the proper functioning of septic systems. This type of on-site, wastewater disposal is the most widely used within basin communities and is expected to predominate in the future.

B. WATER QUALITY STANDARDS AND CLASSIFICATIONS

Water quality standards are the heart of all water quality management programs. By defining the chemical and physical characteristics necessary for various uses, waters of the Commonwealth have been assigned to one of six major classes. Each class is based on the minimum quality criteria necessary to permit a designated or intended water use. Water quality goals for the nation, specified in PL 92-500, require attainment of "fishable-swimmable" conditions for all surfact waters. According to Massachusetts Water Quality Standards, waters assigned to Class B (SB for tidal waters) meet those requirements of PL 92-500. Therefore, the goal of the water quality management program in this basin is attainment, wherever possible, of Class B or SB waters.

Both the North and South Rivers are characterized by separate freshwater and estuarine systems. The primary tributaries of the North River system consist

of the Indian Head and Drinkwater Rivers and French Stream. None of them meet the classifications of fishable and swimmable water. Serious water pollution occurs in this part of the basin and two of the most polluted ponds in the state are located on mainstem streams. The water quality in the estuary of the North River and all of the South River is suitable for water contact recreation and presently supports a wide variety of fish and wildlife. Each river is described in the following sections.

NORTH RIVER

The fresh water portion of the North River forms its headwaters in South Weymouth. This portion of the river is known as French Stream. From its headwaters, French Stream flows south through the northeast corner of Abington and continues through Rockland in a generally southerly direction. The stream turns east in South Rockland at the Back Hill Swamp and continues into Hanover. French Stream reaches its confluence with the Drinkwater River in Hanover.

Drinkwater River is comprised of a number of tributaries draining the northeast section of Rockland, a small section of the northwest portion of Norwell and a major portion of northern and central Hanover. Tributaries to Drinkwater River include Cushing Brook, Ben Mann Brook, Shinglemill Brook and Longwater Brook. Following its confluence with French Stream, Drinkwater River flows into Forge Pond in Hanover.

Water quality in the headwaters of French Stream and Drinkwater River is primarily influenced by the swamps and marshes from which the streams originate. Both rivers serve as home for an abundance of various types of fish, wildlife and vegetation.

Above its confluence with French Stream, water quality in the Drinkwater and its tributaries is quite good, suitable for fish and wildlife propagation and habitat, suitable for public water supply with appropriate treatment and for water contact recreational pursuits. These conditions generally conform to Class B water quality standards. Although water quality is generally good enough for swimming, physical characteristics preclude this use in the Drinkwater and its tributaries.

French Stream is severely polluted by three wastewater treatment plant discharges. The South Weymouth Naval Air Station discharges the effluent from its treatment plant into the very headwaters of the river. A short distance downstream, the discharge from the North Abington treatment plant adds its pollutant load. Farther downstream, the effluent from the Rockland treatment facility is discharged to the river.

The discharges from the treatment plants result in low dissolved oxygen concentrations, high solids loads, high nutrients loads and high bacterial levels. These conditions make the French Stream unsuitable for virtually all uses except fish and wildlife habitat and non-contact recreational use. The water quality of the French Stream is generally below the water quality standard for Class C.

Following the confluence of Drinkwater River and French Stream, the lower water quality of French Stream begins to dominate the water quality of the Drinkwater River, a condition that persists throughout the remaining fresh-water portion of the river.

Negative impacts of the poor water quality of French Stream are clearly visible in Forge Pond. On a severity rating point system of eighteen possible points (0 points Least, 18 points Worst) for unstratified lakes and ponds as developed by the Massachusetts Division of Water Pollution Control (DWPC), Forge Pond totals sixteen points, making it the most severely polluted unstratified pond in the Commonwealth. Excessive nutrients have made the pond eutrophic. Low dissolved oxygen makes the pond unsuitable for most species of fish including trout and bass. High coliform bacteria levels make the pond unsuitable for swimming. However, the pond is suitable for non-contact recreation and possesses good aesthetic qualities.

From the outlet of Forge Pond, the Drinkwater flows south to Factory Pond in Hanover. Factory Pond is a stratified pond. Based on the DWPC severity rating system for stratified lakes and ponds, Factory Pond is the most severely polluted stratified pond in the Commonwealth. Like Forge Pond, Factory Pond totals sixteen out of a possible eighteen severity points. The same conditions exist in Factory Pond as in Forge Pond.

The river, from the outlet of Factory Pond to the Curtis Crossing Dam, is known as the Indian Head River. The river flows in an easterly direction, forming the town boundaries between Hanover on the north and Hanson and Pembroke on the south. The major tributary to the stream is Indian Head Brook in Hanson.

Water quality in the Indian Head River gradually begins to improve as it moves toward Curtis Crossing. The Indian Head is classified as a seasonal cold water fishery and is stocked with trout annually. Based on the large number of trout stocked each year (3,500), fishing pressure is rated as heavy. The river's ability to support even the seasonal fish population is evidence of an improvement in water quality. The river suffers most during the low-flow late summer periods of July and August when dissolved oxygen levels diminish and bacterial levels increase. The Indian Head is suitable as a fish and wildlife habitat, non-contact recreation and has excellent aesthetic values. The stream fluctuates between Class B standard from late fall to early summer and down to Class C standard during late summer and early fall.

As soon as the fresh water from the Indian Head River cascades over the Curtis Crossing Dam, the North River begins. The river is unimpounded downstream from Curtis Crossing. As it flows eastward, the river becomes more and more saline as it becomes subject to tidal influences. There are several major freshwater tributaries to the North River including the Herring Brook in Pembroke, Iron Mine Brook in Hanover, Third Herring Brook in Hanover/Norwell; Second Herring Brook and Stony Brook in Norwell; and First Herring Brook in Scituate. All of these tributaries are of B quality water, capable of supporting fish and wildlife, suitable for public water supply with appropriate treatment, contact recreation and have excellent aesthetic values. However, the physical characteristics of these streams generally preclude swimming in them.

Once in the estuary, water quality improves remarkably due to the efficiency of intense biological activity in cleansing the water as it winds through the salt marshes. Water in the estuary is suitable for a wide variety of uses including fishing, swimming and boating. The river is generally suitable for swimming from the Route 139 area to the Atlantic.

Further evidence of the improved water quality is the fact that the Massachusetts Division of Marine Fisheries has begun a program to introduce coho salmon to the North River. Salmon are a sensitive species with a limited range of tolerances to fluctuations in water quality. The program's limited success over its three-year history is undoubtedly related to the fluctuations in water quality conditions in the Indian Head River and the freshwater streams where salmon and other anadromous fish spawn. Water quality in the North River conforms to the standards for Class SB and SA water.

SOUTH RIVER

The headwaters of the South River arise in the woodlands of western Duxbury. A short distance upstream of the Route 3 crossing the river is joined by Phillips Brook, one of its major tributaries. Phillips Brook drains a large portion of central and northern Duxbury rising from a large number of small ponds and cranberry bogs. Following its confluence with Phillips Brook, the South River flows on in a northeasterly direction into Marshfield. A few hundred feet downstream, the river passes over a small dam at the Veteran's Memorial Park at Route 3A in Marshfield. The South River is tidal below this point.

Water quality in the freshwater portions of the South River is very good. The water conforms to Class B water quality standards, being suitable for fish and wildlife habitat, public water supply with appropriate treatment, contact recreation and has excellent aesthetic values. Swimming is generally not possible due to the physical characteristics of the stream. The South River above Route 3A is stocked with trout annually by the Division of Fisheries and Wildlife. Fishing pressure is rated as light to moderate. Unlike the North River, there are no direct wastewater discharges to the South or its tributaries.

Once over the dam, the river winds its way eastward through tidal wetlands, and then northward between eastern Marshfield and the Humarock Beach and Fourth Cliff areas of Scituate to its confluence with the North River and Massachusetts Bay. Several freshwater brooks draining major portions of Marshfield join the South River estuary. These include Littles Creek, draining Marshfield Center; Bread Creek, draining the Pleasant Street-SeaView Area; Bares Brook, draining the heavily developed portion of the Marshfield Hills; and Hannah Eames Brook which drains the undeveloped portions of Marshfield Hills. Both Bares Brook and Hannah Eames Brook flow into a small pond which discharges to a tidal flat known as Macomers Creek at the mouth of the estuary.

Water quality in the South River below the Veteran's Park Dam is lowered to Class C levels due to high bacteria levels. This factor precludes the use of the river for swimming. As there are no municipal or industrial treatment plant discharges to the South River, the presence of the bacteria can be attributed to a combination of animal and bird wastes plus contributions from septic systems presently serving much of Marshfield. Coliform bacteria is considered to be indicative of the presence of pathogenic, or disease-causing, bacteria irrespective of the source of coliforms. For this reason, the South River estuary, generally down to its confluence with Littles Creek, is considered to be of Class SC water quality. Below

Littles Creek, the South River improves to Class SB conditions as the bacteria levels decrease. At the present time, there is no water quality data available for tributaries to the South River estuary mentioned above. The MAPC Water Quality Project is attempting to remedy this situation through an eight-month monitoring program of several tributaries in the North and South River Basins.

Overall, it can be said that the water quality of the North and South Rivers is of good to excellent quality, evidenced by their sizable fish and shellfish populations, their healthy salt marshes, their support of intensive boating and other recreational uses, and their superb aesthetic values. The remainder of this report will evaluate existing problems and their alternative solutions and will set forth recommendations on the various programs and mechanisms which will be needed over the next twenty years to maintain the overall excellent quality of the rivers, their tributaries and the additional and potential water resources of the basin.

C. ON-GOING PLANNING AND IMPLEMENTATION ACTIVITIES

Presently, there are three on-going planning and implementation activities being conducted on the North River basin. These are described in the following brief paragraphs.

Scenic Rivers Designation

Under the Scenic Rivers Act, the North River Scenic River Committee has completed the draft of the required Management Plan and Regulations required in order to designate the North River as a scenic river. This designation will have a basinwide impact on both land use and water quality.

Soil Conservation Service (SCS) - Natural Resources Planning Study

SCS has initiated a Natural Resources Planning Study in the North River Basin. The purpose of this study is to quantify and qualify all aspects of the natural environment and develop an up-to-date, accurate natural features data base. This data base will then be used by other agencies and local governments in evaluating the impacts of land use and development on the water quantity-water quality resources of the basin.

Woods Hole Marine Biological Laboratory: Ecological Principles Applied to Prediction of Water Quality in Drainage Basins

Scientists from the Woods Hole MBL have submitted a proposal to the National Science Foundation for funding of this study. This proposal includes substantive water quality-water quantity evaluations including ecological surveys of plant, animal and aquatic inhabitants of the basin. This data will be used to develop a decision-making model which will portray the impacts of land use-water disposal decisions on the ecologic balance of the basin, the ecosystem being evaluated. This study has the potential to generate vitally important data and

methodologies which will be required more and more over the next several decades by local and regional agencies and is fully supported by 208 staff.

D. MAJOR BASIN ISSUES

Based on the preceeding discussions, it can be seen that there are several issues which must be addressed at the basin-wide level. These are issues which, although they must also be dealt with by each community, cannot be dealt with effectively by communities acting independently of one another. Such issues for the North-South Basin might be summarized as follows:

- Given the continuing and projected rapid growth and development of the basin, how can that growth be channeled to those areas of the basin most capable of supporting development and minimize environmental impacts?
- Given the delicate relationship between ground and surface water, the heavy reliance on groundwater for the basin's water supply needs, and the similarly heavy interdependence on communities for those supplies, communities must work jointly to protect those supplies.
- Communities in the basin must act now to preserve and protect natural water storage areas such as lakes, ponds, wetlands and swamps so that those areas will not be lost to development pressures which could result in the need for structural alternatives to replace lost storage capabilities.

DUXBURY: RECOMMENDED 203 PLAN

I. WASTEWATER TREATMENT

Duxbury Beach area as recommended by 201 facilities plan be sewerred as part of Marshfield's Phase II construction program.

For presently unsewered areas, i.e., areas sewerred by on-lot disposal systems, an effective and rigorous program for maintenance and inspection of septic systems be formulated and enforced.

The on-going 201 study should evaluate regional alternatives for septage disposal possibly with Pembroke or Kingston. Areas along Duxbury Bay having severe septic system problems should also be evaluated for sewer construction and a possible connection to Marshfield wastewater treatment plant.

II. STORMWATER MANAGEMENT

Operation and maintenance of the stormwater collection system is performed by the Highway Department. Streams and culverts are cleaned regularly. Catch basin cleaning is done by contractor with vacuum equipment. Although some new culverts and catch basins are installed each year, most repairs are done on an emergency basis. The existing system is subject to capacity problems in several areas. Other areas suffer from deterioration and clogged pipes. Some drainage problems exist in areas not served by a storm drain system. Streams have been known to become clogged with debris and overflow during storms. Although the town plans to implement recommendations from a townwide drainage study by Weston and Sampson, no specific projects are planned for the immediate future.

Recommendations to the town include the following:

- The town should develop and adhere to a schedule for implementing the recommendations of the Weston and Sampson drainage study. Priorities should be established to correct problems in deteriorated systems and sections with inadequate capacity.
- The town should investigate the feasibility of correcting drainage problems in areas not served by a storm drainage collection system with non-structural controls.
- Stream maintenance programs should be evaluated and improved where necessary to prevent stream clogging.
- In planning for future development, maximum use should be made of non-structural controls and natural drainage characteristics.

III. ESTIMATED COSTS

Average annual local cost of:

(1) Sewering	\$ 0
(2) Septage	23,000
(3) Stormwater	155,500 (much of this cost already may be included in local budgets)

The above costs are subject to change after facilities planning is done.

IV. INDUSTRIAL WASTEWATER

Two industries in Duxbury have been identified as significant through NPDES permit applications. Marine Research Institute circulates seawater for shellfish propagation and discharges this seawater to Duxbury Bay. An NPDES permit has been issued for this discharge. An NPDES permit has also been issued to the William F. Clapp Laboratories for a discharge to Duxbury Bay.

Recommendations to the town include the following:

- 1) Industries should be encouraged to conserve or recycle their water.
- 2) Industrial discharges to the ground should be monitored to protect the groundwater especially in areas near public wells.

V. NON-POINT SOURCES

A. Landfills. The present landfill is a fairly large facility (10-20 acres) located on Mayflower Road. The site was visited by the 208 staff in January, 1976 and it was observed that no impermeable intermediate cover or final cover was being used. The only cover observed was the excessively drained sand available at the site. The site is, however, planned to be closed and a transfer station instead would be constructed at the site.

Since the site is located on a high yield aquifer, and due to the use of permeable cover material, leachate generation is very possible at this site. It is therefore recommended that the fill should be carefully closed and capped with impermeable material to minimize long-term leachate generation. Groundwater wells along the likely path of leachate movement should be monitored regularly to assess any threat to public health.

B. Salt Storage and Application. No salt contamination has been reported or documented. There are two salt storage sites in the town, one on Tremont Street and the other at the intersection of Chandler, East and Summer Street. The Tremont Street site should be maintained properly since it is covered only with a tarp and piled on dirt pad. Construction of a better salt storage facility is highly desirable.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE NON-POINT SOURCE CONTROLS

Duxbury relies on groundwater for its water supply and has significant areas of high groundwater favorability. In order to protect the recharge function of these areas, the town should continue its efforts to adopt an aquifer protection district.

In the future, Duxbury may want to consider further protection of its water resources by delineating a stream buffer district or by extending its watershed protection district.

VII. MANAGEMENT

The implementation of the intermunicipal agreement between Duxbury and Marshfield is the primary wastewater management recommendation. The five-member intermunicipal committee set up by this agreement will control such things as metering and the maintenance of the system. This agreement should be reviewed by town counsel, and, if necessary, amended to insure consistency with the requirements of section 208 (c)(2) of the Federal Water Pollution Control Act. It should obligate each community to enforce the federal requirements for user charges, industrial cost recovery, sewer system rehabilitation and sewer use ordinances. It should set average daily flow rates with provisions for peak flows and financial arrangements which allocate capital costs and annual operation and maintenance costs (in proportion to flow rates and strength as they relate to treatment costs). An administrative overhead charge provision may also be appropriate. An appropriate sewer use ordinance and drain layer's manual is presented in this plan. It should be reviewed by Duxbury in adopting their own sewer use ordinance.

The Board of Health should initiate a rigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems.

In conjunction with the 201 study evaluation of the septage disposal problem should be a consideration of a mandatory inspection and maintenance program for the community. Such a program could take many forms (see Part II of this plan), and should prompt consideration of a regional board of health depending upon the economies of scale, and the local political feasibility. Such a regional entity should be consistent with any proposed regional septage disposal configuration. At a minimum, the town should establish a Board of Health separate from the Board of Selectmen to insure a timely and competent administration of local public health and environmental codes and ordinances. A regional Board of Health would, of course, be an alternative to a strictly local board.

The Board of Health should also engage in the monitoring of the town landfill and industries in the community presently discharging to the ground to determine groundwater impacts. Any indication of such groundwater pollution, particularly from industrial sources, should be reported to the State Department of Environmental Quality Engineering and the State Division of Water Pollution Control.

The town Planning Board, in conjunction with the Conservation Commission, should evaluate the land use recommendations with respect to existing land use and natural features information in the community. The MAPC, through its technical assistance program, working with the Soil Conservation Service in its Natural Resource Planning Program can assist Duxbury in further refining its land use and natural resources information and developing an action program, consistent with the preventive non-point source controls recommended above, which can be presented to town meeting for implementation.

DUXBURY: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one concept over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included for each concept, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6 percent and is the figure discussed previously in Part II, Section 2. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation. The average annual cost for the septage component of the recommendations would be \$3,000 which would represent an average \$0.02 increase in the tax rate for

the 20-year period. Average annual operating and maintenance costs would be \$20,000.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for Duxbury, there appear to be both negative and positive impacts. Potential erosion problems could occur in areas of steep slope, erodible soils or sparse vegetation.

In those areas where the use of sewer service has been recommended as a solution for water quality, erosion problems would be aggravated for those potential erosion lands.

A short-term negative impact of using sewers in an area considered as having erosion potential is that during the construction phase of installing sewerage there would be considerable disruption of the landscape. This removal of natural vegetation, plus the increased traffic for the construction work, would mean an increase in the potential for erosion. Positive impacts would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect and would be a long-term consequence.

The amount of potential erosion areas affected by the recommendations in Duxbury appears to be approximately 50 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effects.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that slightly positive impacts could result. Lands with potential flood control problems are considered to be steep slope areas.

Zoning use and density changes would mean lower residential densities than what presently exists, thus decreasing the potential for flood control problems. This would be a long-term effect, lasting for the duration of this development pattern. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for Duxbury appear to have both positive and negative impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability. Sewers in areas of groundwater favorability could mean that the water used in these areas would no longer be recharged to the ground; rather it would be carried out of the community, thereby greatly reducing groundwater recharge in these areas. However, some positive effects on groundwater would accrue with the adoption of an aquifer protection district. This environmental district poses special constraints on development, and by minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental district remains in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations do constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low and moderately low density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rates as potential wildlife habitats at the present time and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The use of an aquifer protection district in Duxbury would provide a positive benefit for wildlife. The development constraints imposed by this land use regulation would provide local benefits for as long as the regulation was in effect.

E. Air Quality Impacts. It is anticipated with the growth patterns projected in the recommendations, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the recommendations will have a negligible impact on air quality.

One short-term effect which would be very localized in significance would be that the level of particulate matter in the atmosphere would be expected to rise temporarily during the construction phase of the sewerage expansion because of the truck transportation of materials and supplies to and from the construction sites.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Duxbury would be moderate with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents. In a few areas in the basin, small open space parcels are adjacent to or surrounded by land zoned for industrial use. Impacts from this type of development on open space could be slightly negative, long-term, but primarily of local importance.

In Duxbury, a few parcels of public and semi-public lands fall within wetlands protection district. The additional development constraints contained in this district would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay district remains in force and would be an impact of local significance. The addition of the recommended aquifer protection district would also enhance open space amenities in Duxbury. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

In several spaces in Duxbury where open space could be affected by development, the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, co-commercial or moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it should be noted that where the permitted residential density would be decreased, according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. A review of the potential impacts of the recommendations on existing archaeological and historic sites in Duxbury indicates that the growth pressure could create negative impacts on archaeological sites. These sites are in areas zoned for moderately low residential development and in one case in an area zoned commercial. Certainly when a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss of any of the archaeological sites would be regional in significance.

In addition to the future growth pressure on archaeological sites, the recommendations indicate potential positive impact on at least one of the sites. One site is located within the existing wetlands district. The provisions of this district act as development constraints, thus giving additional protection to the archaeological sites.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 2090 housing units anticipated for Duxbury means that 1780 acres of residential land will be developed over the 20-year period. Duxbury should be capable of accommodating the expected residential demand.

Duxbury allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

The existing and outlined environmental zoning districts, which would either prohibit or constrain housing development, occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. Recommendations for Duxbury would have negligible impact on manufacturing opportunities in the community. However, as the 201 facilities plan is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in Duxbury.

HANOVER: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

The town should immediately initiate a 201 facilities plan for septage disposal and treatment. Regional septage treatment possibly with Norwell or Pembroke should provide a preferable regional alternative.

The town should initiate an effective and rigorous maintenance and inspection program for on-lot sewage disposal systems. Reconstruction of some malfunctioning septic systems is appropriate where persistent water quality problems have been documented. This is especially true of the area in and around Hanover Center.

Although there is no need for townwide sewerage, package plants should be evaluated under 201 facilities plan (as under recommendation 1) for areas in the West and South Hanover where chronic septic system problems have been documented.

II. INDUSTRIAL WASTEWATER

Two industries in Hanover have been identified as significant dischargers. Standard Rubber Products has been issued an NPDES permit to discharge to the Drinkwater River. Gem Gravure Co., Inc. was identified as a potential discharger of toxic wastes and was included in the significant industry list. Recommendations to the town include the following:

- 1) Industries should be encouraged to conserve or recycle their water.
- 2) Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public wells.

III. STORMWATER MANAGEMENT

The Highway Division of the Department of Public Works operates and maintains the town's stormwater collection system. Hanover Mall has its own maintenance personnel who conduct a yearly catch basin cleaning program with a hired scoop cleaner. The town also performs annual catch basin and drain cleaning. The town continues to correct localized storm drainage problems through repair and new construction funding. Recommendations to the town include the following:

- 1) Regular programs of stream maintenance should be developed and implemented where they do not exist already.
- 2) In planning for future development, maximum use should be made of non-structural measures and natural drainage characteristics.
- 3) Salt use and storage should be carefully monitored by the town in order to prevent contamination of valuable water supply resources.

IV. NON-POINT SOURCES

A. Landfills. The town has a transfer station at the site of a former town landfill. No pollution problems attributable to the former landfill have been documented. It is, however, recommended that two municipal wells located along a tributary to Iron Mine Brook should be periodically monitored against any health hazard.

B. Salt Storage and Application. An open, town salt pile located in Hanover Town Center is causing severe contamination in a nearby brook, according to MAPC sampling conducted from May to November, 1976. It is likely that this site is polluting groundwater supplies. Another town salt pile, a new site on Winter Street near Sanusset is tarp covered but no impervious pad beneath it is being used. It is recommended that both of these town salt storage sites be upgraded to properly controlled salt storage facilities. Construction of a shed with impervious floor pads is highly desirable.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

V. ESTIMATED COSTS

Average Annual Local Costs for

(1) Sewerage	\$ 0	
(2) Septage Treatment	16,700	
(3) Stormwater	128,950	(much of this cost already may be included in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

VI. PREVENTIVE LAND USE CONTROLS

Hanover should adopt a stream buffer district to cover unprotected streams. The elevations along some streams do not allow the floodplain district to create an effective buffer. The Town should also utilize cluster zoning to minimize potential groundwater and aquifer problems and to provide an alternative pattern of development. In the future, Hanover should consider delineating an aquifer recharge and protection district. Although it relies on municipal wells, the wells are partially protected already. The Town should also consider rezoning to allow only low residential density in certain areas where the current zoning maybe incompatible with the environmental capability of the land to support intensive or dense development.

VII. MANAGEMENT

With the initiation of a 201 facilities plan for septage disposal and treatment the town should consider intermunicipal managements with Norwell and Pembroke regarding the design, construction and operation of a regional septage facility.

The Board of Health should initiate a rigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners should be undertaken. Indications of malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of such systems.

If consistent with the recommendations of the proposed 201 facilities plan for septage disposal the board of health should institute a mandatory inspection and maintenance program for septic systems in the community. Such a program should be immediately considered for the area in and around Hanover Center. Such a program could take many forms (see Part II of this plan), and should prompt consideration of a regional board of health depending upon the economies of scale and the local political feasibility. Such a regional entity should be considered in conjunction with regional septage treatment alternatives presented in the recommended 201 facilities plan, and therefore consider such an arrangement with Norwell and/or Pembroke.

If package plants are constructed a sewer commission should be formed having control over these facilities.

The Board of Health should carefully monitor industrial discharges to the ground. Municipal wells should be carefully monitored pursuant to state drinking water regulations for contamination from the closed landfill or salt storage areas. The Highway Department should insure that roadsalt is properly stored to prevent water quality impacts.

The town planning board, in conjunction with the conservation commission should evaluate the landuse recommendations made above with respect to existing land use and natural features information in the community. The MAPC, through its technical assistance program, working with the Soil Conservation Service in its Natural Resources Planning Program can assist Hanover in further refining its land use and natural resources information and developing an action program, consistent with the preventive non-point source controls recommended above, which can be presented to town meeting for implementation.

HANOVER: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one concept over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6% and is the figure discussed previously in Part I, Chapter I.

The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation. The average annual cost for Hanover would be \$2,200.00 with a tax rate impact of \$0.04. The annual O & M cost would be \$14,500.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for Hanover there appear to be minimal impacts. Potential erosion problems could occur in areas of steep slope, erodable soils or sparse vegetation.

Positive effects could result in those areas where the intensity of permitted development would be reduced by reduction in the zoning density permitted and in the area affected by the stream buffer district. Potential erosion problems would be reduced in these areas, and this would be a positive effect and would be a long-term consequence.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effects.

B. Flood Control Impact. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that minimal impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The adoption of the stream buffer district would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in additional areas which could have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

More detailed review of these impacts should be addressed in the 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for Hanover appear to have slightly positive impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Some positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as stream buffer districts. Because this environmental district impose special constraints on development, it would also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean

lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a longterm effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impact. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations do not constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in most of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitat

E. Air Quality Impact. It is anticipated with the growth patterns projected in the recommendations, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the recommendations will have negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impact. Generally, impacts on public and semi-public lands in Hanover would be moderate with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents. In a few areas in the basin, small open space parcels are adjacent to or surrounded by land zoned for industrial use. Impacts from this type of development on open space could be slightly negative, long-term, but primarily of local importance.

Where public and semi-public lands fall within recommended stream buffer areas, the additional development constraints contained in this district would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the zoning district remains in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

It also should be noted that where the permitted residential density would be decreased according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. A review of the potential impacts of the recommendations on existing archaeological and historic sites in Hanover indicates that the growth pressure would create negligible impacts.

c. Housing Impact. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The over 500 projected housing units anticipated for Hanover means that almost 500 acres of residential land will be developed over the 20-year period. The town appears to be capable of accommodating the expected residential demand.

Hanover allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in these towns may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a basin perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the communities of the basin. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impact. The recommendations for Hanover represents little or no reliance on structural solutions to water quality problems and as a result it would seem that opportunities for employment in manufacturing would not be increased. There may be some cases in which some opportunities may be fore-closed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

Hanover currently has 20% of the manufacturing employees in water-intensive industries, and this comprises three percent of the total town employment. The water-intensive employment is projected to decrease to 16% of the manufacturing employment by 1995 and to two percent of total employment.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

MARSHFIELD: RECOMMENDED 203 PLAN

I. WASTEWATER TREATMENT

The town should proceed with the proposed construction of sewers and treatment facilities as recommended by the 201 facilities plan. For areas not proposed for sewerage in the immediate future, the town should enforce rigorous inspection and maintenance programs for on-lot sewage disposal systems. Septage should be pumped out periodically and transported to the Marshfield treatment facility for treatment and disposal.

II. STORMWATER MANAGEMENT

Maintenance of the existing storm drainage system is performed by the Highway Division of the Department of Public Works. Many pipe lines and culverts in the town are subject to flooding problems due to insufficient capacity. Drainage systems along the shoreline do not operate properly at high tides. At the present time, Marshfield is in the process of implementing recommendations from a comprehensive storm drainage report by Coffin and Richardson.

Recommendations to the town include the following:

- Stream maintenance programs should be developed and implemented where they do not exist already.
- Salt use and storage should be monitored closely by the town to ensure adequate protection of the town's water supply.
- In planning for future development, maximum use should be made of non-structural control measures and natural drainage characteristics.

III. ESTIMATED COSTS

Average annual local costs for:

(1) Sewerage	0	
(2) Septage Treatment	\$42,800	
(3) Stormwater	187,500	(much of this cost may already be included in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

No industries in Marshfield were identified as significant dischargers. Recommendations to the town include the following:

- 1) The town should adopt the MAPC-Model Sewer Use Law, or its equivalent, for the purposes of protecting the physical structures from

damage and to maintain the treatment plant efficiency. In addition, a drain layer's manual should be amended to the law or adopted separately to regulate the installation of sewer connections.

- 2) Industries in unsewered areas of the town should be encouraged to conserve or recycle their water. New industries should be required to discharge sanitary and process wastewaters (with pretreatment, if required) to the sewer system.
- 3) Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public wells.

V. NON-POINT SOURCES

A. Landfills. The present landfill is a large facility (25-40 acres) located in a former sand and gravel pit off Clay Pit Road. According to the state records, the facility operates under a plan approved in 1974. It is categorized by the state as a dump and cover as opposed to a sanitary landfill as specified in landfill regulations. It is recommended that the present landfill should be upgraded to conform to sanitary landfill requirements. Present practice of using local sand as cover should be replaced by using an appropriate impermeable material. The town should undertake periodic water quality monitoring of Furnace Brook and the municipal well that lies in the basin of that brook.

B. Salt Storage and Application. Town road salt is stored on Clay Pit Road in a covered shed. No adverse impacts on nearby waters were noted.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Marshfield has significant areas of high groundwater favorability. Since the town relies on groundwater for water supply, an aquifer protection district should be adopted. Marshfield should continue to employ cluster zoning as a technique to minimize potential groundwater and aquifer problems and to provide an alternative pattern of development of its water resources by delineating a stream buffer district or a watershed protection district.

In the future, Marshfield should review their zoning to rezone some areas to allow only low density residential development because of potential conflicts between the current zoning and the environmental capability of the land to support intensive or dense development.

VII. MANAGEMENT

Marshfield should implement the 201 related requirements of an acceptable user charge system, and a sewer use ordinance. The sewer use ordinance and drain layer's manual presented in this plan should be considered by the town in adopting its own ordinance. The town counsel should review the intermunicipal sewer service agreement with Duxbury to insure consistency with the requirements of section 208 (c) (2) of the Federal Water Pollution Control Act. It should obligate each community to enforce the federal requirements for user charges, industrial cost recovery, sewer system rehabilitation and sewer use ordinances. It should set average daily flow rates with provisions for peak flows and financial arrangements which allocate capital costs and annual operation and maintenance costs (in proportion to flow rates and strength as they relate to treatment costs). An administrative overhead charge provision may also be appropriate. The Department of Public Works (Water and Sewer Division) is the appropriate agency for the management of wastewater collection and treatment facilities.

The Marshfield Board of Health should initiate a rigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems.

In conjunction with the 201 study evaluation of the septage disposal problem should be a consideration of a mandatory inspection and maintenance program for the community. Such a program could take many forms (see Part II of this plan), depending upon the goals and resources of the community.

Marshfield should undertake, under the auspices of the Board of Health and the Department of Public Works, a groundwater and surface water monitoring program to conclusively determine the water quality impacts of the town land-fill.

The town planning board, in conjunction with the conservation commission, should evaluate the land use recommendations with respect to existing land use and natural features information in the community. The MAPC, through its technical assistance program, working with the Soil Conservation Service in its Natural Resources Planning Program can assist Marshfield in further refining its land use and natural resources information and developing an action program, consistent with the preventive non-point source controls recommended above, which can be presented to town meeting for implementation.

MARSHFIELD: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impact

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACT

In the final analysis, cost effectiveness will play a major role in the selection of one solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6 percent and is the figure discussed previously in Part I, Chapter I. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost would be \$5,600. for Marshfield, which would have an impact on the local tax rate of \$0.04. The annual operation and maintenance cost would be \$37,200.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impact. In examining the possible effects on erosion of the water quality recommendations for Marshfield, there appears to be substantial negative impacts. Potential erosion problems could occur in areas of steep slope, erodible soils or sparse vegetation.

In those areas where growth and the use of sewer service is being examined in the 201 planning work as a solution for water quality, erosion problems would be aggravated for those potential erosion lands. This increased problem could result in two ways; one being short-term in duration, while the other one would be a long-term consequence.

A short-term negative impact of using sewers in an area considered as having erosion potential is that during the construction phase of work there would be considerable disruption of the landscape. This removal of natural vegetation, plus the increased traffic for the construction work, would mean an increase in the potential for erosion.

An impact for erosion potential which would be of long-term significance in the use of sewers is that the intensity and density of land uses permitted in an area can be altered and increased with sewers. One effect of this change in permitted land uses would be that the more intense development would aggravate existing erosion problems. This impact would last as long as the development and would tend to be irreversible.

Different effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect and would be a long-term consequence.

The amount of potential erosion areas potentially affected by future growth in Marshfield appears to be over 700 acres.

The 201 facilities planning work being done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effects.

B. Flood Control Impact. When assessing the potential effects of the projected growth in terms of potential flood control problems, it appears that significant negative impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

In those areas which are considered as having potential flood control problems, the use of sewers or additional growth would increase the potential problems. This would be an adverse consequence of this water quality management program which would be long-term in duration. The opportunities for reversing such impacts once they have taken place would appear to be limited, although

the use of sewers as a solution for water quality does permit an area to accommodate a broader range of intensities and densities of land uses, without potential water quality degradation problems. Since an area with potential flooding problems should be maintained in its natural state as much as possible so as to minimize flooding, increased development in areas of growth would mean potentially increased flood control problems.

The adoption of the environmental zoning districts would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan. It appears that over 700 acres are subject to flood control problems through future growth, and this should be examined more fully.

C. Groundwater Impacts. The wastewater solutions recommended for Marshfield appear to have some negative impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

In undeveloped areas outlined for the use of sewers in the 201 plan, there could be an accompanying increase in residential density from low to moderate density. Sewers in areas of groundwater favorability could mean that the water used in these areas would no longer be recharged to the ground; rather it would be carried out of the community, thereby greatly reducing groundwater recharge in these areas. Negative effects could result on the recharge capacity of these areas and also present contamination problems through infiltration. This can be seen as long-term impact, since any effects created would continue to occur throughout the lifetime of that development. Due to the low probability of reversing this type of effect once it is established, this impact could constitute an irreversible commitment of groundwater resources. The results of a negative impact might not be limited to a single area or community, since many communities utilize groundwater supplies common to more than a single town.

However, some positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as aquifer protection watershed districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations do constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time and reduces their capacity to provide habitats. The potential impact on wildlife habitats could product a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

Areas outlined for sewer service would negatively affect wildlife by diminishing the capacity of the habitats to support wildlife. However, one positive affect would be that if growth and density were increased in the sewer service area, by clustering growth there, then the total amount of land needed to accommodate growth, in a more dispersed pattern, would be reduced. In this way more land could remain as potential wildlife habitats by remaining in a natural and undeveloped state.

The use of floodplain/wetland districts would provide a positive benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

The amount of potential wildlife habitat affected by these recommendations appears to be about 450 acres.

E. Air Quality Impacts. It is anticipated with the growth patterns projected in the recommendations, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the recommendations will have a negligible impact on air quality.

One short-term effect which would be very localized in significance would be that the level of particulate matter in the atmosphere would be expected to rise temporarily during the construction phase of any sewerage expansion because of the truck transportation of materials and supplies to and from the construction sites.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Marshfield would be minimal with development according to the projected growth. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents.

It should also be noted that where the permitted residential density would be decreased, according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archeological and Historic Impacts. A review of the potential impacts of the projected growth on existing archaeological and historic sites in Marshfield indicates that the growth pressure would create slightly negative impacts on only a few sites. These few sites are either zoned for moderately residential development, or they are adjacent to such uses. Certainly when a site is actually developed, the impact is significant and long-term and the commitment is irreversible. The loss of any of the archaeological or historic sites would be regional in significance.

In addition to the future growth pressure on archaeological sites, local zoning indicates potential positive impact on some of the sites. Several sites are located within the wetlands overlay districts. The provisions of these districts act as development constraints, thus giving additional protection to the archaeological sites.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the future growth in Marshfield in terms of the amount of land available in the community. The projected 4700 housing units anticipated by 1995 for Marshfield means that almost 3600 acres of residential land will be developed over the twenty-year period. Marshfield does appear to be capable of accommodating the expected residential demand in land available.

Marshfield allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in those towns may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a basin perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the communities of the basin. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use of residential on-site disposal which would increase housing costs.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is necessary to determine the potential impact of these costs upon such manufacturing establishments. Because cost impacts ultimately will affect jobs, it is important to estimate what firms may be most affected by the requirement of the water quality plan.

It can be seen that Marshfield would have both potentially positive and negative impacts on manufacturing. The expansion and use of sewer service areas as outlined in the 201 study would allow opportunities for increased levels of manufacturing activities, and thereby increase employment levels. The principle reason for such an effect is that with the introduction of sewer service to industrial land, these areas could assimilate more structural development, which could then accept more labor-intensive economic activities. An example might be the difference between a warehouse employing only a half dozen people and an electrical machinery plant employing a few hundred. Indeed, the presence of sewerage might encourage some towns to rezone areas for industrial use, given the proper market, and other economic conditions.

Counterbalancing this increased opportunity for accommodating manufacturing activities is the requirement that industries pay a proportional share of the capital costs of sewage treatment, based on their share of the waste load. This potential cost to industries could inhibit plant expansion, or initial location, thereby precluding the full measure of employment opportunities.

There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

Marshfield does have some water-intensive industry and by 1995 this type of employment is expected to grow by almost 30 percent. As a percentage of total employment, however, this is only two percent.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

NORWELL: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

There is no need for town-wide sewerage, but an effective and vigorous inspection and maintenance program for on-lot septic systems should be undertaken by the town.

The town should initiate a 201 facilities planning study to evaluate septic disposal and treatment alternatives. Regional septic treatment possibility with the town of Hanover should be looked into.

If severe septic system malfunctioning problems continue to prevail in certain parts of the town, especially around Jacobs Pond, the town should consider small package plants with limited local sewerage.

II. STORMWATER MANAGEMENT

Operation and maintenance of the stormwater collection system is done by the Highway Department. Catch basins and some stormdrains are cleaned on an annual basis. The town plans to implement recommendations from a comprehensive drainage report by CDM; however, no specific projects have been chosen for immediate implementation.

Recommendations to the town include the following:

- An implementation strategy and schedule should be developed by the town to correct problems with the existing system as recommended by CDM.
- Catch-basin cleaning should be augmented by street sweeping in the Accord Pond, Jacobs Pond and Third Herring Brook drainage areas as all three are vital aspects of the water supplies of three communities.
- In the above regard, salt storage and application should be carefully monitored by the town to protect its water supply.
- In planning for future development, maximum use should be made of non-structural control measures and natural drainage characteristics.

III. ESTIMATED COSTS

Average annual local cost of:

- 1) Sewerage \$ 0
- 2) Septage \$ \$14,500
- 3) Stormwater \$ \$118,000 (much of this cost already may be included in local budgets)

IV. INDUSTRIAL WASTEWATER

No industries in Norwell were identified as significant dischargers. Recommendations to the town include the following:

- 1) Industries should be encouraged to conserve or recycle their water.
- 2) Industrial discharges to the ground should be monitored to protect the ground water especially in areas near public wells.

V. NON-POINT SOURCES

A. Landfills. The town landfill is located in a former gravel pit on Pine Street. It is no longer in operation and final closing and sealing procedures acceptable to the state and the town are being worked out.

Although no adverse impacts on the North River due to probable leachate travel from the dump have been documented, the potential of such pollution can be minimized by closing the facility properly. It is recommended that the fill should be sealed with an impermeable layer of clay to prevent rainfall infiltration and covered with soil and vegetation to prevent erosion.

B. Salt Storage and Application. A town maintained road salt pile is located on Route 123 at Wildcat Brook. It is uncovered and has no impervious pad and is causing severe contamination of the brook.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Norwell relies on groundwater for its water supply and has significant areas of high groundwater favorability. In order to protect the recharge function of these areas, the town should adopt an aquifer protection district.

Norwell should employ cluster zoning as an additional technique to avoid groundwater and aquifer problems and to provide an alternative pattern of development. In addition, a stream buffer district should be delineated since the elevations along some streams does not allow the floodplain district to create an effective buffer. Water supply reservoirs also need to be protected from development that could contaminate the water. A comprehensive approach that would serve to protect all the town's water resources would be a water resource protection district.

In the future, Norwell should consider rezoning to allow only low residential density in areas where current zoning may conflict with the environmental capability of the land to support intensive or dense development.

VII. MANAGEMENT

The Norwell Board of Health should initiate vigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems. In conjunction with the 201 study, evaluation of the septage disposal problem should be a consideration of a mandatory inspection and maintenance program for the community. Such a program could take many forms (see Part II of this plan), and should prompt consideration of a regional board of health depending upon the economies of scale, and the local political feasibility. Such a regional entity should be consistent with any proposed regional septage disposal configuration. The establishment of such a district with the town of Hanover should be considered.

If package plants are constructed to serve certain problem areas, such as Jacobs Pond, the establishment of a sewer commission to manage such facilities is recommended.

It is recommended that the Highway Department construct a salt storage shed to prevent adverse surface and groundwater quality impacts. The Highway Department should request that the Finance Committee propose, and town meeting approve the allocation of necessary funds.

The Board of Health should also engage in the monitoring of the recently closed town landfill and industries in the community presently discharging to the ground, to determine groundwater impacts. Any indication of such groundwater pollution, particularly from industrial sources, should be reported to the state Department of Environmental Quality Engineering and the state Division of Water Pollution Control.

The town planning board, in conjunction with the conservation commission, should evaluate the land use recommendations with respect to existing land use and natural features information in the community. The MAPC, through its technical assistance program, working with the Soil Conservation Service in its Natural Resources Planning Program, can assist Norwell in further refining its land use and natural resources information and developing an action program, consistent with the preventive non-point source controls recommended above, which can be presented to town meeting for implementation.

NORWELL: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one concept over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effects this annual cost would have on the property tax rate. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included for each concept, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6 percent and is the figure discussed previously in Part I, Chapter I. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost for the septage component of the recommendations would be \$1900, which represents an average \$0.02 increase in the tax rate for the 20-year period. Average annual operating and maintenance costs would be \$12,600.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for Norwell, there appear to be moderately positive impacts.

Positive effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas and these impacts would be a long-term consequence.

Recommended environmental overlay districts for Norwell would reduce or prohibit most types of new development. Thus, potential erosion problems would be further minimized.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effects.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that positive and negative impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

Currently, there are approximately 270 acres of land in Norwell, which are subject to significant growth pressures. As scattered low density residential development continues, flood control problems could occur. However, the use of clustering as recommended would help minimize these potential problems.

The adoption of the environmental zoning districts would have a positive effect on flood control problems. These regulations would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

More detailed review of potential flood control impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for Norwell appear to have moderately positive impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Positive effects on groundwater could accrue in areas where groundwater favorability coincides with recommended environmental zoning districts, such as the aquifer protection, stream buffer and watershed protection districts. Because these environmental districts impose special

constraints on development, they function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts remain in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Clustering would direct development away from areas of high groundwater favorability to these areas that can support development without water quality degradation. Revised land use controls would also mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations do constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The amount of potential wildlife habitat found in Norwell is approximately 9400 acres. The continuation of growth as low and moderately low density type of development, which has been occurring up to now, means that urban development is dispersed across the community. One result of this dispersed type of growth is that some urban development appears on all of these areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The recommended use of environmental zoning districts in Norwell would provide a positive benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

E. Air Quality. It is anticipated with the growth patterns projected in the recommendations as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the recommendations will have a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands would be slight with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents. In a few areas

in the basin, small open space parcels are adjacent to or surrounded by land zoned for industrial use. Impacts from this type of development on open space could be slightly negative, long-term, but primarily of local importance.

In Norwell, several scattered public lands fall within recommended water resource protection districts. The additional development constraints contained in these environmental districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

It also should be noted that where the permitted residential density would be decreased according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

In several places where open space could be affected by development, the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial or commercial use would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space. Recommended clustering would also serve to preserve more open space while accommodating future growth.

B. Archaeological and Historic Impacts. Impacts on archaeological and historic sites in Norwell would be slightly positive. These sites appear to be located in areas where environmental zoning districts, such as the stream buffer and watershed protection districts, would be recommended if not already in force. The provisions of these districts act as development constraints, thus giving additional protection to the archaeological and historic sites.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the Environmental Assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 687 housing units anticipated for Norwell means that about 600 acres of residential land will be developed over the 20-year period. Norwell appears to be capable of accommodating the expected residential demand, because of a significant surplus of available residential acreage.

Norwell allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

The existing and outlined environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. Impacts on manufacturing in Norwell would be negligible.

However, as 201 facilities planning is done, detailed analysis of pre-treatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

ROCKLAND: RECOMMENDED 203 PLAN

I. WASTEWATER TREATMENT

The town should consider extending sewer service to areas with persistent septic system problems, especially a large area south of the French Stream. The town should initiate a rigorous and effective program for septic system inspection and maintenance in unsewered areas.

The existing wastewater treatment facility should be expanded to include septage receiving tanks and provide for septage treatment for town's unsewered population.

II. STORMWATER MANAGEMENT

Rockland is the most urbanized of the six communities in the North River Basin. The town is served by a comprehensive storm drainage collection system. Evaluation of Rockland's stormwater collection system is limited because of lack of information. Some of the older drains are reportedly deteriorated and there are cases of smaller drains receiving flow from large drains. Many drains have inadequate capacity and reportedly need maintenance. The Sewer Department employs two men to maintain the storm drainage system. Each devotes half his time to this work.

Recommendations to the town include the following:

- A comprehensive drainage study should be performed by the town. Based on that study, the town should develop and implement regular programs of catch basin cleaning and stream channel maintenance. Street sweeping should be done if necessary.
- The town should evaluate its present operating procedures and consider putting control of the storm drainage system with the Highway Department.
- Salt use and storage should be carefully monitored.
- In planning for future development, maximum use should be made of non-structural control measures and natural drainage characteristics.

III. ESTIMATED COSTS

Average annual local cost of various alternatives is as follows:

(1) Sewerage	\$470,710	
(2) Septage Treatment	5,500	
(3) Stormwater Management	91,850	(much of this cost already may be included in local budgets)

IV. INDUSTRIAL WASTEWATER

Two industries in Rockland have been identified as significant dischargers. F.L. and J.C. Codman, Co. and Progressive Engineering, Inc. were designated as significant industries because they may discharge to a watercourse without an appropriate permit. Recommendations to the town include the following:

- 1) The town should adopt the MAPC Model Sewer Use Law, or its equivalent, for the purposes of protecting the physical structures from damage and to maintain the treatment plant efficiency. In addition, a drain layer's manual should be amended to the sewer use law or adopted separately to regulate the installation of sewer connections.
- 2) Industries should be encouraged to conserve or recycle their water.
- 3) New industries should be required to discharge sanitary and process wastewaters (with pretreatment, if required) to the sewer system.

V. NON-POINT SOURCES

A. Landfills. The old town landfill located on Pleasant Street should be properly sealed according to state requirements. It is recommended that the new landfill located off Beech Street should be operated strictly according to the state regulations for sanitary landfills. Use of sandy soil as cover material should be avoided. An impermeable material like clay should be used as cover material to prevent rainfall infiltration. This practice would reduce the likelihood of groundwater degradation by leachate percolation.

B. Salt Storage and Applications. The town stores its road salt in a covered shed on a bituminous pad (an excellent impermeable substance) at 841 Market Street. No threat to nearby ground or surface waters has been identified.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Rockland should delineate and enact a wetlands/floodplains district to deal with existing water quality problems. Water supply reservoirs also need to be protected from development that could lead to contamination of the water.

A water resource protection district would be a comprehensive approach for the community in order to protect both surface and groundwater. Rockland should also employ zoning which would also minimize threats to the groundwater and the recharge function.

In the future, Rockland may find it necessary to rezone certain areas where current zoning conflicts with the environmental capability of the land to support intensive or dense development.

VII. MANAGEMENT

It is recommended that the Board of Sewer Commissioners, in addition to meeting federal requirements by adopting an acceptable user charge system, consider the revision of its present sewer use ordinance consistent with the model sewer use ordinance and drain layer's manual presented in this plan. In addition, the Board of Sewer Commissioners should investigate allegations of improper operating procedures at the existing facility. The local, state and federal investment in new treatment processes will not be cost-effective unless the facilities are properly operated.

The Board of Health should initiate a rigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping, to the reconstruction of failing systems, to requiring connection to the town sewer system whenever feasible. New industries, locating in the community should be required to connect to sanitary sewers (with appropriate pretreatment, if necessary and required by the Board of Sewer Commissioners).

The Board of Health should carefully monitor both the old town landfill and the new landfill to insure that both meet state standards.

The town Planning Board, in conjunction with the Conservation Commission, should evaluate the land use recommendations with respect to existing land use and natural features information in the community. The MAPC, through its technical assistance program, working with the Soil Conservation Service in its Natural Resources Planning Program, can assist Rockland in further refining its land use and natural resources information and developing an action program, consistent with the preventive non-point source controls recommended above, which can be presented to town meeting for implementation.

ROCKLAND: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one concept over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included for each concept, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6% and is the figure discussed previously in Part II, Section 2. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost for the recommendations would be \$321,400 which would mean an average annual tax rate impact of \$4.30. Average annual operating and maintenance costs would be \$154,800.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible affects on erosion of the water quality recommendations for Rockland there appear to be slightly positive impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

In those areas where the use of sewer service has been recommended, no negative impacts would result since the areas that would be sewered are not considered as having potential erosion problems.

In those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by clustering, potential erosion problems would be reduced and this would be a positive effect of long-term and local significance.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effects.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that mostly positive impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

In Rockland, approximately 500 acres of land under considerable growth pressures whould have flood control problems if developed. While expansion of sewer service is recommended, this would not increase the potential for flood control problems.

The adoption of the environmental, wetland/floodplain district would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for Rockland appear to have both positive and negative impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

In undeveloped areas outlined for the use of sewers, there could be an accompanying increase in residential density from low to moderate density. Reduced development costs resulting from such a density change could increase the probability of development. Sewers in areas of groundwater favorability could mean that the water used in these areas would no longer be recharged

to the ground; rather it would be carried out of the community, thereby greatly reducing groundwater recharge in these areas. Also, with increased development comes increased consumption of the groundwater through local wells. Negative effects could result on the recharge capacity of these areas and also present contamination problems through infiltration. This can be seen as long-term impact, since any effects created would continue to occur throughout the lifetime of that development. Due to the low probability of reversing this type of effect once it is established, this could constitute an irreversible commitment of groundwater resources. The results of a negative impact might not be limited to a single area of community, since many communities utilize groundwater supplies common to more than a single town.

However, some positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as floodplain and wetland overlay districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force. Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities and clustering, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a longterm effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations do constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitat. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

Areas outlined for sewer service would negatively affect wildlife by diminishing the capacity of the habitats to support wildlife. However, one positive affect could be that if growth and density was increased in the sewer service area, by clustering growth there, then the total amount of land needed to accomodate growth, in a more dispersed pattern, would be reduced. In this way land could remain as potential wildlife habitats more by remaining in a natural and undeveloped state.

The adoption of environmental zoning such as the floodplain/wetland districts in Rockland would provide a positive benefit for wildlife. The development constraints imposed by these and the regulations would provide local benefits for as long as the regulation was in effect.

The amount of potential wildlife habitat affected by these recommendations appears to be about 1700 acres.

E. Air Quality Impacts. It is anticipated with the growth patterns projected in the recommendations as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the recommendations will have a negligible impact on air quality.

One short-term effect which would be very localized in significance would be that the level of particulate matter in the atmosphere would be expected to rise temporarily during the construction phase of the sewerage expansion because of the truck transportation of materials and supplies to and from the construction sites.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Rockland would be moderate with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned for medium density residential development. Development at this density could result in more use of existing open space and recreation areas by the residents.

In Rockland several scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these floodplains, wetlands, or watershed protection districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

Development pressures could increase if sewers were built in presently undeveloped areas, resulting in greater use of open spaces for recreation. It should be noted that, while sewer construction would allow for higher residential densities, if the projected population growth remains about the same through a phased growth management system as discussed in Part II, Section 5, that growth could be accommodated on less total acreage, thus leaving more open land for recreation and aesthetic enjoyment. Impacts would be long-term and of local significance.

However, it also should be noted that where the permitted residential density would be decreased according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

In several places in Rockland where open space could be affected by development the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, commercial, or moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

B. Archaeological and Historic Impacts. There are no known archaeological or historic sites in Rockland.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 1176 housing units anticipated for Rockland means that about 500 acres of residential land will be developed over the 20-year period. Rockland appears to be capable of accommodating the expected residential demand.

Rockland allows moderate amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the outlined environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

The reduction in residential lot sizes that could accompany the outlined sewers might permit the construction of more moderately-priced housing. In terms of alleviating the short supply of such housing, such an outcome would produce a positive impact. Average on-site land costs may be reduced from \$17,000-\$22,000 under basic one-acre requirements to \$11,000-\$15,000 under medium density requirements. This is a significant reduction that, together with the advent of sewers, would enhance development potential significantly.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of Rockland, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle-income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

a. Manufacturing Impacts. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is necessary to determine the potential impact of these costs upon such manufacturing establishments. Because cost impacts ultimately will affect jobs, it is important to estimate what firms may be most affected by the requirements of the water quality plan.

It can be seen that the recommendations would have both potentially positive and negative impacts on manufacturing. The expansion and use of sewer service areas as outlined in Rockland would allow opportunities for increased levels of manufacturing activities, and thereby increase employment levels. The principle reason for such an effect is that with the introduction of sewer service to industrial land, these areas could assimilate more structural development, which could then accept more labor-intensive economic activities. An example might be the difference between a warehouse employing only a half-dozen people and an electrical machinery plant employing a few hundred. Indeed, the presence of sewerage might encourage the town to rezone areas for industrial use, given the proper market, and other economic conditions.

Counterbalancing this increased opportunity for accommodating manufacturing activities is the requirement that industries pay a proportional share of the capital costs of sewage treatment, based on their share of the waste load. This potential cost to industries could inhibit plant expansion, or initial location, thereby precluding the full measure of employment opportunities.

There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

SCITUATE: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

It is recommended that the town proceed with already planned expansion of the sewer system and additions to the existing treatment facility. This would alleviate pollution problems related to areas with chronic septic system failures. Such areas were identified by the Scituate Sewer Study Committee (1976).

The town should also assess any damage done to sub-surface disposal systems by the February 1978 blizzard on the coastal areas.

The present wastewater treatment facility should be upgraded and expanded to include septage treatment for septic system pumpings from the unsewered population of the town.

The town should initiate and enforce a strict inspection and maintenance program for on-lot disposal systems. This would prevent septic systems from abrupt failure.

II. STORMWATER MANAGEMENT

Operation and maintenance of the stormwater collection system is performed by the Highway Department. The town is presently completing improvements to several sections of the system which have been plagued by flooding problems in past years due to inadequate capacity, poor inlet locations, poor road grading and low street elevation relative to tide levels. Front Street as well as several smaller drainage areas is included in this improvement program. A program of catch basin cleaning is carried out annually.

Recommendations to the town include the following:

- Stream and channel maintenance and cleaning should be performed in addition to catch basin cleaning.
- Salt use and storage should be carefully monitored by the town, particularly in the Old Oaken Bucket Waterhshed.
- In planning for future development, maximum use should be made of non-structural control measures and natural drainage characteristics.

III. ESTIMATED COSTS

Average annual local costs for various alternatives is as follows:

(1) Sewerage	\$130,000	
(2) Septage Treatment	21,400	
(3) Stormwater Management	177,750	(most of this cost already may be included in local budgets)

See Part II of this draft Areawide Plan for an explanation of the cost estimation methodologies.

IV. INDUSTRIAL DISCHARGES

The Golden Rooster Restaurant has been issued an NPDES permit for a discharge of treated wastewater to the Gulf in North Scituate. The treatment consists of oil and grease separation, screening, activated sludge clarification and chlorination.

Recommendations to the town include the following:

- 1) The town should adopt the MAPC-Model Sewer Use Law, or its equivalent, for the purposes of protecting the physical structures from damage and to maintain the treatment plant efficiency. In addition, a drain layer's manual should be amended to the sewer use law or adopted separately to regulate the installation of sewer connections.
- 2) Industries should be encouraged to conserve or recycle their water.
- 3) New industries should be required to discharge sanitary and process wastewaters (with pretreatment, if required) to the sewer system.
- 4) Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public well.

V. NON-POINT SOURCES

A. Landfills. It is recommended that:

- the former town dump located on Stockbridge Road should be properly closed and capped to minimize leachate generation. Periodic inspection and maintenance should be performed in order to insure that cracks, which would admit water to the refuse and result in leachate generation, do not appear in the final cover.
- The water quality of nearby wells and Old Oaken Bucket Pond should be monitored for evidence of long-term impacts.
- The proposed new landfill on the Driftway should be operated strictly according to state regulations for sanitary landfills. Suitable cover material, such as clay, should be used instead of a sandy soil available at the site. The clay barrier, if effective, will prevent lateral leachate migration to the adjacent Coleman Hills well.

B. Salt Storage and Application. A town maintained salt pile is located in the open on Captain Pierce Road, where there is a likelihood of its adversely affecting nearby surface water.

It is recommended that a proper salt storage facility consisting of a shed and an impermeable bottom should be constructed to prevent draining of salt into surface waters.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Scituate, since it relies on groundwater for water supply and has significant areas of high groundwater favorability, should adopt an aquifer protection district. As an additional protection of its water resources, the community should delineate a stream buffer district, since elevations along some streams do not allow the floodplains district to create an effective buffer and a watershed protection district to reduce the risk of contamination of reservoirs which development may cause. An alternative to this piecemeal approach would be an all-encompassing water resource protection district. In addition, Scituate should employ cluster zoning which would minimize potential groundwater and aquifer problems and to provide an alternative pattern of development. In the future, potential conflicts between the current zoning and the environment capability of the land to support development could be minimized by rezoning those areas to allow only low density residential development.

VII. MANAGEMENT

It is recommended that Scituate, in conjunction with the upgrading of its treatment facility, revise its existing sewer use ordinance. It is in the process of this revision now to meet 201 requirements, and should, in doing so, refer to the model sewer use ordinance and drain layers manual presented in this plan. The town's wastewater facilities are currently under the direct control of the Board of Selectmen and administered by the Department of Public Works. While consideration should be given to the establishment of a local sewer commission to insure that important wastewater issues are not overlooked, the benefits of centralized management which the present system provides may argue in favor of retention of the present management arrangement.

The Board of Health should initiate a vigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic

systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems, to requiring connection to the town sewers if such a connection is feasible.

The Board of Health should also engage in the monitoring of the former town dump, the town landfill and industries in the community presently discharging to the ground to determine groundwater impacts. Any indication of such groundwater pollution, particularly from industrial sources, should be reported to the state Department of Environmental Quality Engineering and the state Division of Water Pollution Control.

The town planning board, in conjunction with the conservation commission, should evaluate the land use recommendations with respect to existing land use and natural features information in the community. The MAPC, through its technical assistance program, working with the Soil Conservation Service in its Natural Resources Planning Program can assist Scituate in further refining its land use and natural resources information and developing an action program, consistent with the preventive non-point source controls recommended above, which can be presented to town meeting for implementation.

SCITUATE: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one concept over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included for each concept, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6 percent and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual charge in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost for Scituate would be \$82,800, which represents an average tax rate impact of \$0.68 during the repayment schedule. Average annual operating and maintenance costs would be \$68,600.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for Scituate, there appear to be both negative and positive impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

In those areas where the use of sewer service has been recommended as a solution for water quality, erosion problems would be slightly aggravated for those potential erosion lands. This increased problem would be short-term in duration.

A short-term negative impact of using sewers in an area considered as having erosion potential is that during the construction phase of work there would be considerable disruption of the landscape. This removal of natural vegetation, plus the increased traffic for the construction work, would mean an increase in the potential for erosion.

Different effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect and would be a long-term consequence.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effects.

B. Flood Control Impacts. When assessing the potential effects of continued growth in terms of potential flood control problems, it appears that slightly negative impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas. The extent of possible flood control problem areas appears to be about 95 acres in Scituate.

In those areas which are considered as having potential flood control problems, the use of sewers as outlined in the recommendations would not aggravate the potential problems.

The adoption of the environmental water resource districts would have a positive effect on flood control problems. These regulations would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulations remained in effect.

More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for Scituate appear to have both negative and positive impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Sewers in areas of groundwater favorability could mean that the water used in these areas would no longer be recharged to the ground; rather it would be carried out of the community, thereby greatly reducing groundwater recharge in these areas.

However, some positive effects on groundwater could accrue with the adoption of an aquifer protection district and in areas where groundwater favorability coincides with other environmental zoning districts, such as the recommended stream buffer and watershed protection districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the projected growth anticipated in Scituate do constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low to moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community.

One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitat.

The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The use of water resource protection districts in Scituate, such as an aquifer protection district or a stream buffer district, would provide a positive benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

The amount of potential wildlife habitat affected by future development appears to be about 3500 acres.

E. Air Quality Impacts. It is anticipated with the growth patterns projected in the recommendations, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the recommendations will

One short-term effect which would be very localized in significance would be that the level of particulate matter in the atmosphere would be expected to rise temporarily during the construction phase of the sewerage expansion because of the truck transportation of materials and supplies to and from the construction sites.

III. SOCIAL IMPACTS

A. Open Space and Recreation. Generally, impacts on public and semi-public lands in Scituate would be slightly negative with future development and slightly positive from the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents.

In Scituate, several scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these stream buffer or watershed protection districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term productivity of the environment.

In several places in Scituate where open space could be affected by development, the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, commercial, or moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. A review of the potential impacts on the recommendations of existing archaeological sites in Scituate indicates that the growth pressure could create negative impacts on only a few sites. These few sites are either zoned for moderately low residential or industrial development; or they are adjacent to such uses. Certainly when a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss on any of the archaeological sites would be regional in significance.

In addition to the future growth pressure on archaeological sites, the recommendations indicate potential positive impact on the sites. In fact, the sites are located within environmental zoning districts, such as wetlands and floodplain overlay districts. The provisions of these districts act as development constraints, thus providing potential protection to the archaeological sites.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the environmental assessment, which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 1220 housing units anticipated for Scituate means that about 800 acres of residential land will be developed over the 20-year period. Scituate appears to be capable of accommodating the expected residential demand, because of the relatively large amount of available residential acreage.

Scituate allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional, as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the outlined environmental zoning districts, which would either prohibit or constrain housing development, are located in parts of the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

The land development recommendations for zoning changes would reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is necessary to determine the potential impact of these costs upon such manufacturing establishments. Because cost impacts ultimately will affect jobs, it is important to estimate what firms may be most affected by the requirement of the water quality plan.

It can be seen that the recommendations would have slightly negative impacts on manufacturing to the extent that it occurs in Scituate. The recommendations for Scituate include land management controls to minimize water quality problems and as a result it would seem that opportunities for employment in manufacturing would be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

IPSWICH BASIN OVERVIEW

A. PROFILE OF THE IPSWICH RIVER BASIN

The Ipswich River Basin is located in the northeastern quadrant of the MAPC 208 study area. The basin is bounded by the North Coastal Basin to the southeast, the Mystic River Basin to the south and the Merrimack and Parker River Basins to the west and north. (The latter two basins are not within the planning jurisdiction of the MAPC.) Eight communities are located largely or entirely within the Ipswich Basin. They are:

Burlington	North Reading	Wenham
Hamilton	Reading	Wilmington
Middleton	Topsfield	

Four other communities (Beverly, Danvers, Lynnfield and Peabody) are located partially within the basin; however, the majority of each of these cities and towns is located in the North Coastal Basin, and they are therefore covered in that basin section.

The basin can be generally characterized as a moderately-rapid growing group of affluent communities undergoing suburban development, chiefly for low density residential use.

Between 1950 and 1975 the population of the basin nearly tripled. According to MAPC projections, an additional increase in population of 35 percent is projected to 1995, giving a total of 125,700 persons by that time.

The proximity of basin towns to Routes 1, 128, 93 and 95, which serve to link most of the basin to the urban core of the metropolitan area, has further enhanced the area's attraction as a highly desirable suburban setting. In general, residence in the Ipswich River Basin affords home ownership with the amenities of country and water-oriented living, together with easy access to regional employment and cultural centers.

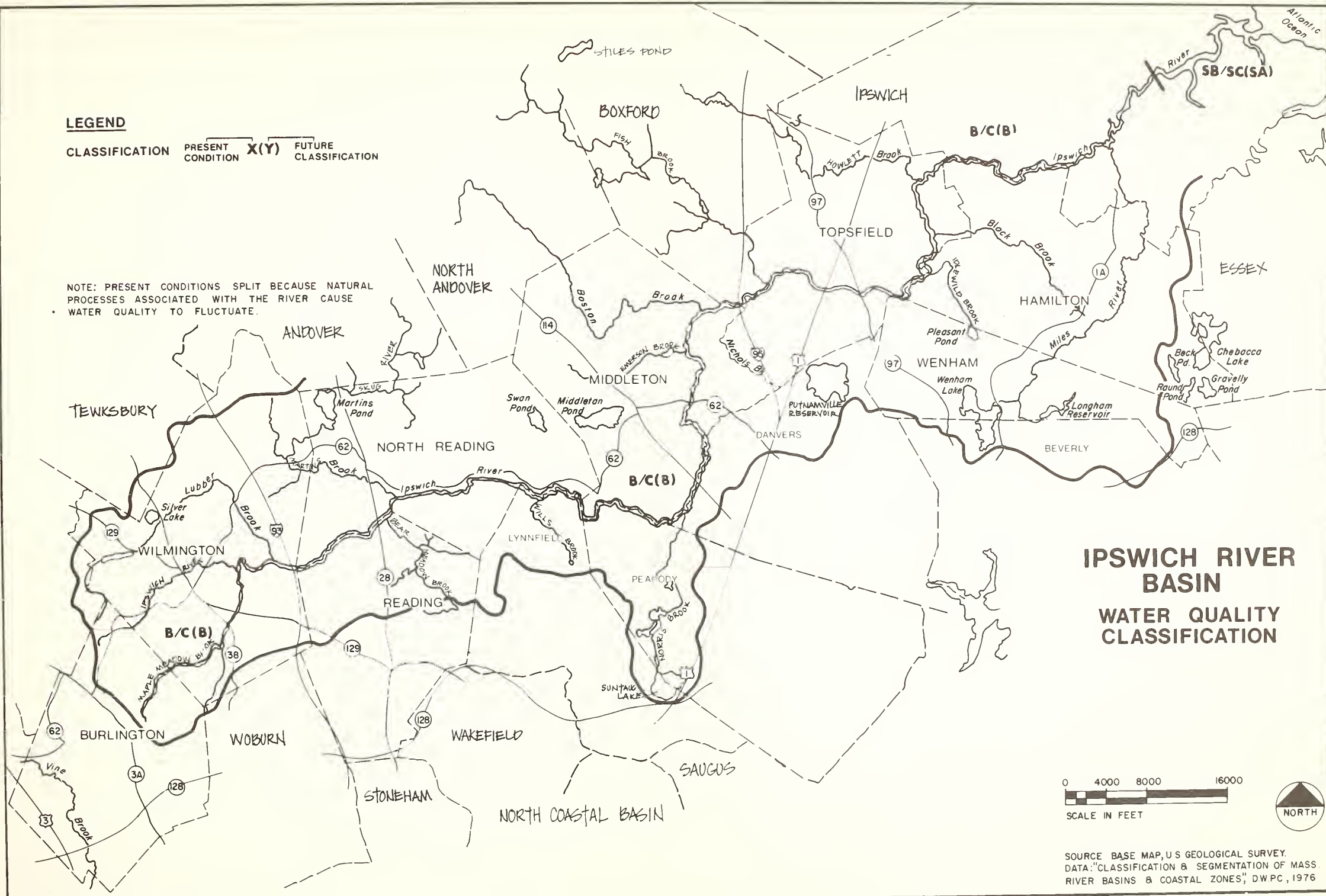
Growth is expected to continue in most economic sectors, particularly in the services, construction, and trade sectors. These areas of employment are all expected to increase about 60 percent by 1995. Overall, there is expected to be a 61 percent increase in employment, representing almost 50,000 new workers by 1995, according to MAPC projections.

Land use data indicates that housing construction has consisted predominantly of single-family housing on lots of one-half to one acre. Multi-family construction has been minimal by comparison, with the headwater communities of Burlington and Reading (which are comparatively more oriented to the core of the metropolitan area than to the rest of the basin) having the largest number of multi-family units. Commercial development has occurred mainly in "strip" fashion along major arterials and in town centers. Industrial acreage is somewhat limited, presently accounting for about 8 percent of the total acreage.

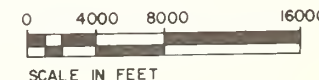
LEGEND

CLASSIFICATION PRESENT CONDITION **X(Y)** FUTURE CLASSIFICATION

NOTE: PRESENT CONDITIONS SPLIT BECAUSE NATURAL PROCESSES ASSOCIATED WITH THE RIVER CAUSE WATER QUALITY TO FLUCTUATE.



IPSWICH RIVER BASIN WATER QUALITY CLASSIFICATION



SOURCE: BASE MAP, U.S. GEOLOGICAL SURVEY.
DATA: "CLASSIFICATION & SEGMENTATION OF MASS RIVER BASINS & COASTAL ZONES", DWPC, 1976

CHANGES IN COMMUNITY POPULATION AND PROJECTIONS: IPSWICH RIVER BASIN *												
AREA	1950 ¹	1960 ¹	% Δ '50 '60	1970 ²	% Δ '60 '70	% Δ '50 '70	1975 ³	1980 ⁴	1985 ⁴	1990 ⁴	1995 ⁴	% Δ '70-'95
BEVERLY	22,884	36,108	25.0	38,348	6.2	32.8	37,400	40,500	41,500	42,500	43,000	12.1
BURLINGTON	3,250	12,852	295.0	21,980	71.0	576.3	24,400	25,900	27,300	28,000	28,500	29.7
DANVERS	15,720	21,926	39.5	26,151	19.3	66.4	25,000	25,300	26,600	27,800	28,900	10.5
HAMILTON	2,764	5,488	99.0	6,373	16.0	130.6	6,700	6,900	7,500	8,100	8,600	34.9
LYNNFIELD	3,927	8,398	114.0	10,826	29.0	175.5	12,000	12,900	13,800	14,400	14,800	36.8
MIDDLETON	2,916	3,718	28.0	4,044	9.0	38.7	4,000	5,100	5,500	5,900	6,100	50.8
N. READING	4,402	8,331	89.0	11,264	35.0	155.9	12,100	13,200	14,000	14,800	15,400	36.7
PEABODY	22,645	32,202	42.0	48,080	49.3	112.3	45,500	45,600	47,000	48,000	49,500	2.9
READING	14,006	19,259	37.5	22,539	17.0	60.9	23,700	26,000	27,800	29,500	30,500	35.3
TOPSFIELD	1,412	3,351	137.0	5,225	56.0	270.0	5,900	7,000	7,800	8,500	8,900	70.3
WENHAM	1,644	2,798	70.0	3,849	37.6	134.1	3,400	3,500	3,800	4,200	4,700	22.1
WILMINGTON	7,039	12,475	77.0	17,103	37.0	143.0	17,500	18,700	20,200	21,400	22,000	28.6
TOTAL	108,609	166,906	53.7	215,782	29.3	98.7	217,600	230,600	242,800	253,100	260,900	20.9

1 U.S. Census of Population

2 U.S. Census of Housing

3 State Census

4 WPC Projections

*Burlington, Hamilton, Middleton, North Reading, Reading, Topsfield, Wenham, and Wilmington are the subject of the Ipswich Basin Report; the other communities are included in the North Coastal Basin Report.

B. WATER QUALITY IN THE BASIN

Overall water quality in the Ipswich River Basin ranges from good to excellent, as evidenced by the wide variety of uses the basin supports. These uses include public water supply, swimming, finfishing and shellfishing, and fish and wildlife habitat. According to the use classifications promulgated by the Division of Water Pollution Control, the Ipswich River and its tributary streams are meeting class A and class B standards for fresh waters and class SA and SB for salt waters. These standards are periodically violated by high coliform bacteria levels and low dissolved oxygen. These conditions typically occur in the later summer early fall period. Unlike other rivers in the study area, the causes of these problems are not treatment plant or industrial discharges. Rather, these problems are generally considered to be of natural origin. In other words, the high coliform levels are due to the large wildlife population living in the basin, while the low dissolved oxygen is caused by the leaching of organic materials from the swamps and marshes which make up nearly one-quarter of the basin's area. It is important to remember that coliforms are considered to indicate the presence of pathogenic bacteria (disease causing) irregardless of the source of the coliforms. This means that the standards mentioned above are periodically violated which limits the uses to which the river can be put, particularly drinking without treatment, swimming, and in the estuary, shellfishing.

The headwaters of the Ipswich River are located in the wetlands of northern Burlington near Route 62. The river is an intermittent stream at this point. The stream is joined by Maple Meadow Brook in Wilmington. From this point on the river is a continuous stream.

A short distance downstream, Lubber Brook joins the Ipswich. Lubber Brook is designated as a seasonal cold water fishery by the Division of Fish and Wildlife and is stocked with 200 fish annually. Flowing in a generally northeast direction, the river continues into North Reading where it is joined first by Bear Meadow Brook and then by Martins Brook. Bear Meadow Brook originates in the Cedar Swamp in Reading, while Martin's Brook drains a large tributary area including portions of Wilmington, North Reading and Andover.

As the Ipswich continues through North Reading, it receives flows from three small unnamed tributaries. Wills Brook joins the stream as it crosses into Middleton. A small backwater pond is formed by the dam at the USM Corporation in Middleton. Immediately downstream from the dam is a U.S. Geologic Survey streamflow gaging station.

The river flows onward through Peabody and Danvers, joined first by Norris Brook in Peabody and then an unnamed tributary in Middleton. This section of the river has been classified as a cold-water fishery by the Division of Fish and Wildlife and is stocked with 9,000 trout each year.

As the river turns northward through Middleton, it is joined by the outlet of Middleton Pond, Emerson Brook and Boston Brook. Both Emerson Brook and Boston Brook originate in North Andover joining the Ipswich in Middleton. Boston Brook is classified as a seasonal cold water fishery by the Division of Fish and Wildlife and is stocked with 500 trout each year.

Nichols Brook and Fish Brook join the Ipswich as it swings eastward into the Wenham Swamp through Topsfield, Wenham and Hamilton. Fish Brook is also a seasonal cold-water fishery stocked with 500 trout per year. The intake for the Salem-Beverly Water Supply Board is also located in the Wenham Swamp.

The Ipswich turns northward as it leaves the Wenham Swamp. Idlewild Brook, Mile Brook and Howlett Brook all reach their confluence with the Ipswich in this section. Howlett Brook is also a seasonal cold water fishery stocked with 500 fish annually.

The river turns east again as it forms the border between the towns of Ipswich and Hamilton. Gravelly Brook, draining a portion of the Willowdale Street Forest, joins the river at that point. The river widens there due to a series of small dams known collectively as the Willowdale Dam. The second USGS streamflow gage is located at this point.

Black Brook joins the river below the dam. The river turns northeast into the town of Ipswich. The Miles River and Kimball Brook join the river upstream of the Sylvania Dam in Ipswich Village. The Ipswich becomes tidal a short distance below the Dam and then flows unobstructed to its confluence with Ipswich Bay and the Atlantic Ocean.

As stated earlier, the water quality of the Ipswich is generally high enough to support a wide variety of intensive uses including public water supply, swimming and other types of contact recreation, fishing and outstanding aesthetics. Although the current water pollution problems are considered to be of natural origin, the river does suffer some abuse due to the competing demands for the high quality water of the basin such as water supply withdrawals and subsurface wastewater disposals; large volume out-of-basin transfers of water to serve as water supply for communities outside the Ipswich Basin; and sewerage wastewater out of the Ipswich Basin to treatment plants which discharge this water to the ocean, thus leaving it unavailable for re-use within the basin. The following Section of this plan will attempt to identify the major water quality problems and solutions in the Ipswich Basin. In addition, solutions to the identified problems will be discussed in order to provide local decision-makers with the choices necessary to manage this magnificent resource to best serve the needs of man, and at the same time, to conserve and preserve the natural beauty and life of the Ipswich River Basin.

C. ON-GOING PLANNING AND IMPLEMENTATION ACTIVITIES

Currently, there is only one program on-going in the Ipswich Basin; however, that one program is of major significance to the entire basin. This is the Water Allocation Study being done by Metcalf & Eddy under contract to the Ipswich River Watershed District Commission of the Massachusetts Water Resources Commission. Having recognized the present and future impacts of major diversions of surface and groundwater for public water supplies on the water resources of the basin, the IRWDC commissioned this water allocation study to determine how future competing water supply demands could be met with the water resources available in the basin at the same time maintaining streamflow in the Ipswich River. The draft of this study should be available in 1978.

Gloucester, Rockport, Ipswich and Essex are four of a number of Massachusetts communities not previously designated for study in the original 208 programs. The state DEQE must complete 208 plans for all non-designated areas by June 1979. MAPC, under contract with DEQE, is currently developing a Cape Ann 208 program to study these four communities. Any waste treatment management plans will determine the use of future federal funds for water pollution control. As with the other 208 plans, this means that no permits or grants for water pollution projects or methods can be authorized that are in conflict with the adopted plans and that state and federal water pollution control strategies and priorities must be based on these plans. A Policy Advisory Committee consisting of more than half local officials is being formed to review 208 recommendations during the course of the study. In June 1976, local officials of Gloucester, Rockport, Essex and Ipswich identified the following water quality problems they felt should be included in the Cape Ann 208 program:

- untreated discharges (residential, municipal combined sewer)
- stormwater runoff
- erosion, sedimentation
- failing septic systems
- industrial pretreatment (fish processing)
- vessel discharges
- landfills
- salt water intrusion
- impact of upstream water quality
- inadequate treatment from existing plants

D. MAJOR BASIN ISSUES

As demonstrated in the previous discussions, many of the issues which must be addressed by communities in the Ipswich River basin must be addressed basin-wide. Perhaps the most important issue is presently being addressed by the Water Allocation Study (above). Other issues include the out-of-basin transfer issue (which is also involved in the Water Allocation Study), protection of wetlands as storage areas, mutual protection of shared water supply recharge areas and the issue of wastewater treatment and disposal in the Ipswich River. If it becomes necessary to sewer beyond recommendations of this or other plans, could land application systems guarantee groundwater quality while providing needed recharge or, in the interest of protecting water quality, would major out-of-basin transfers of wastewater be required? For the study period, 208 staff does not foresee a need to sewer much beyond current facilities plans. However, it is important that these issues begin to be addressed today.

BURLINGTON: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

Eighty percent of the population in the town is sewered and served by the MDC's Metropolitan Sewerage District. No major problems have been documented for the on-lot sewage disposal systems. Septage is pumped and disposed of into a municipal sewer. No recommendations are being made for the town with respect to wastewater treatment. It is, however, recommended that the town should enforce a rigorous and effective inspection and maintenance program for septic systems in unsewered parts of the town.

II. STORMWATER MANAGEMENT

Burlington has an extensive stormwater collection system. The inventory of stormwater facilities performed by Camp, Dresser and McKee (CDM) located twenty-six stormwater systems and their tributary drainage areas. The majority of these systems serve fairly small tributary areas. Only four areas are over 100 acres in size. All of these systems discharge to tributaries of the Ipswich, Shawsheen and Mystic Rivers.

The town's Department of Public Works is responsible for the operation and maintenance of the stormwater system. Presently, regular catch basin cleaning is the only practice used by the DPW. The following recommendations are intended to be implemented in the near future by the town and to guide the town's officials in their stormwater management program for the next five to ten years.

- In addition to regular catch basin cleaning, the DPW should institute a semi-annual program of inspecting outfalls and receiving streams to determine the need for instituting stream maintenance programs and the need for installing grates or other structural devices to control sediment build-up and channel erosion on and around outfalls.
- Future land development, where possible, should make maximum use of existing drainage structures. Other development should, to the greatest extent possible, make use of natural drainage patterns and new facilities should be designed accordingly.
- The drainage system serving the Burlington Mall should be studied to determine the characteristics of the system (plans are not available) so that alternative measures can be investigated to control oils and grease and sediment associated with extensive paved areas used for transportation related purposes from having a negative impact on Vine Brook.

The foregoing recommendations are general in nature and are not meant to take the place of - but rather are intended to complement - the comprehensive drainage study currently being undertaken by Burlington's consulting engineers.

III. ESTIMATED COSTS

Average annual local costs are as follows:

- | | | |
|-----------------------|-----------|---|
| (1) Sewerage | 0 | |
| (2) Septage Treatment | 0 | |
| (3) Stormwater | \$188,850 | (much of this cost already may be in local budgets) |

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Two industries in Burlington were identified as significant dischargers by NPDES permit applications. Thomas Quinn Co. Inc. has been issued a permit for the discharge of quarry water to Butterfield Pond. RCA-Aerospace has a permit application pending issuance.

Recommendations to the town include the following:

- 1) The town should adopt a sewer use law that is comparable to the model sewer use law developed by the MAPC. In addition, a drain layer's manual should be adopted to regulate the installation of sewer connections.
- 2) New industries should be required to discharge sanitary and process wastewaters (with pretreatment, if required) to the sewer system. Water conservation and recycling of process wastewater should be encouraged.

V. NON-POINT SOURCES

A. Landfills. No landfill leachate problems were identified in Burlington. The town's solid waste is hauled out of the basin.

The town should consider a regional resource recovery program as its future solid waste option.

B. Salt Storage and Application. Serious water quality problems have caused the movement of Burlington's road salt pile from the Highway Department yard to a temporary site opposite Burlington Mall. The permanent site should be chosen to prevent salt contamination and a covered shed with an impervious floor should be built.

The state salt storage depot near Winn and Cambridge streets should be carefully monitored and appropriate structural and operational solutions instituted if contamination is found beyond the site.

The snow dumps at the Burlington Mall should be monitored for contaminated runoff.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells and streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Burlington does not have wetlands/floodplains zoning. However, accurate maps of floodplains are already being compiled as part of the community's comprehensive drainage study. Therefore, a floodplain/wetlands zoning district should be delineated and adopted by the town within the next year or so.

If sewers are not introduced, Burlington should rezone areas where the current zoning conflicts with the environmental capability of the land to support dense development.

VII. MANAGEMENT

Since no recommendations are being made for Burlington with respect to wastewater treatment, no corresponding management recommendations can be made. However, because the community is connected to the MSD, the community will be required to implement and maintain a user charge and industrial cost recovery billing and collection system which must be approved by the MDC and EPA. Additionally, once MDC promulgates presently proposed rules and regulations covering discharge of sewage, drainage, substance of wastes to the MSD system, communities will be required to have in effect a sewer use by-law or ordinance no less stringent than the regulations of the MDC. These requirements will place significant administrative and management burdens on Burlington. Reference should be made by Burlington to the model sewer use ordinance and drain layer's manual presented in this plan.

The Board of Health should initiate rigorous maintenance and inspection programs for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems, requiring connection to the municipal collection system when a septic system fails or becomes a nuisance (as required in Section 1 of the town's Regulations for Sewage Disposal).

The Planning Board, in conjunction with the Conservation Commission, should review the preventive land use control recommendations presented above. At a minimum, a floodplain/wetlands zoning by-law should be developed using existing floodplain information for presentation to town meeting.

BURLINGTON: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

There will be no direct costs resulting from the wastewater treatment recommendations. The stormwater management costs may already be largely in local budgets.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the future development in Burlington, there appears to be moderately negative impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation where development pressures are significant. Approximately 340 acres could have erosion problems due to development.

However, different effects would result in those areas where the density of permitted residential development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

The amount of potential erosion areas that would be affected by these zoning changes in Burlington appears to be approximately 150 acres.

B. Flood Control Impacts. When assessing the potential effects of future growth in terms of potential flood control problems, it appears that significant impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas and steep slope areas. Approximately 500

acres in Burlington could be negatively affected as a result of significant growth pressures.

However, the adoption of the environmental, wetland/floodplain districts would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

The extent of the flood control problem areas that could be affected by this regulation appears to be 160 acres in Burlington.

C. Groundwater Impacts. The wastewater solutions recommended for Burlington appear to have positive impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as floodplain and wetland overlay districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

This positive effect appears to be occurring randomly throughout the town, and in no area does the district coincide consistently with the groundwater favorability areas. These moderately positive effects would continue for as long as the environmental districts are in force.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future development constitute moderate amounts of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as moderate density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

However, the use of floodplain/wetland districts in Burlington would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

The amount of potential wildlife habitat affected appears to be about 700 acres.

E. Air Quality Impact. It is anticipated with the growth patterns projected as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. Therefore, impacts on air quality would be negligible.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Burlington would be slightly positive with development according to the recommended solutions.

In several places in Burlington where open space could be affected by development the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less dense residential land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased, according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. There are no known archaeological or historic sites in Burlington.

C. Housing Impacts. In Burlington, all the available residential acreage is currently zoned for medium density (minimum lot sizes ranging between 8,713 and 21,799 square feet). Even with the recommended zoning changes, Burlington should have little difficulty meeting future demand for housing. Furthermore, because Burlington is zoned for medium residential density and allows multi-family housing, access to housing for moderate income families would not be as difficult as in other communities in the region that allow only single-family housing on large lots (one acre or more).

IV. ECONOMIC IMPACTS

A. Manufacturing. The process of cleaning up area waterways and water bodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is necessary to determine the potential impact of these costs upon such manufacturing establishments. Because cost impacts ultimately will affect jobs, it is important to estimate how manufacturing may be affected by the requirements of the water quality plan.

The recommendations include the use of wetlands/floodplains zoning. Because of the development constraints imposed by this type of regulation, it would seem that opportunities for employment in manufacturing would be reduced.

Some existing manufacturing activities may be affected by this overlay zoning by making industrial uses non-conforming. This would have implications for their future expansion plans.

Burlington has 698 jobs in water-intensive employment, which is expected to decrease to 350 jobs by 1995. As a percentage of total employment, in 1995, this is about nine percent.

HAMILTON: RECOMMENDED 208 PLAN

I. WASTWATER TREATMENT

The town does not have any municipal sewers and no need for townwide sewerage has been assessed. The town should be able to continue with on-lot disposal systems until 1995 without encountering any major problems provided necessary maintenance is carried out. The following recommendations are, however, considered appropriate for the town.

- 1) The town should initiate a 201 facilities planning study to evaluate septage disposal alternatives. The present septage disposal facilities, which essentially consist of three shallow pits, need to be improved according to the new state requirements. Regional alternative of disposing septage into SESD sewers should also be evaluated.
- 2) Facilities planning should also evaluate construction of 3 package plants with limited local sewerage for areas having severe problems with septic systems. These problem areas include Ashbury Grove and Pleasant Pond area, Chebacco Lake area off Gregory Island Road and Shore Drive area.
- 3) The town should enforce a strict inspection and maintenance program for on-lot sewage disposal systems. The maintenance program should include regular periodic pumping of septic tanks and proper disposal of septage.

II. STORMWATER MANAGEMENT

Hamilton is one of the less urbanized communities in the Ipswich Basin. As such, stormwater runoff is not considered to be a problem at the present time.

Presently, catch basin cleaning is done on an annual basis by the Highway Department. Recommendations to the town include:

- Outfalls and receiving streams should be inspected on an annual basis and cleaned or repaired as necessary.
- In site planning for future land development, maximum use should be made of natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

(1) Sewerage	0	
(2) Septage Treatment	\$13,100	
(3) Stormwater Management	\$86,600	(much of this cost may already be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

No significant industries have been identified in Hamilton.

Recommendations to the town include the following:

- 1) Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public wells.
- 2) Industries should be encouraged to practice water conservation and to recycle their process waste waters.

V. NON-POINT SOURCES

A. Landfills. The Hamilton landfill showed good operating and grading practices during a staff visit in 1976. It is especially important that this continue because of the location of the landfill over a high yield aquifer and near a wetland.

Operating practices should include the placement of clay over each lift and careful grading in order to maintain slopes.

Careful monitoring of ground waters by Hamilton should be undertaken to test the effectiveness of operating practices and to protect nearby public water supplies.

A regional resource recovery program or regional landfill located and operated to prevent pollution should be considered by the town after the current landfill is exhausted.

B. Salt Storage and Applications. Hamilton stores road salt in a covered shed and no contamination problems result from storage.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive target (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

A buffer zoning district of at least 100 feet should be established along the southeastern shore of Chebacco Lake. This is the only undeveloped and unprotected part of the lake in Hamilton, which is located largely in Essex and which has gravel-packed wells as the only water supply of that community.

Much of the aquifer recharge area which protects the high yield ground-water supply underlying Hamilton is already zoned for single-family lots of either 40,000 square feet or 2 acres. A cluster option should be adopted in these two zoning districts, along with the contingent site plan review powers. The idea is to minimize interruption of the aquifer's recharge function by controlling the siting of structures and other impervious surfaces. However, soils for on-lot sewage disposal or communal subsurface systems must be adequate in the area proposed for clustered development.

A few areas currently zoned for medium density residential development, which is incompatible with the environmental capability of the land to support that development, should be rezoned for low residential density.

VII. MANAGEMENT

Hamilton town meeting should authorize the initiation of a 201 facilities planning study to evaluate septage disposal alternatives, including the consideration of an arrangement with the SESD for septage disposal (would require a special act of the legislature).

If facilities planning shows the construction of package plants to be a cost-effective solution for severe septic system problem areas, then the creation of a local sewer commission or department or the assignment of operation and maintenance responsibility to the Highway Department would be necessary. Public ownership of these systems would insure administrative and operational effectiveness, as well as federal grant eligibility. A sewer use ordinance and a sewer charge system would, of course, have to be established.

The Board of Health should initiate a rigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping, to the reconstruction of failing systems.

In conjunction with the 201 study evaluation of the septage disposal problem should be a consideration of a mandatory inspection and maintenance program for the community. Such a program could take many forms (see Part II of this plan), depending upon the goals and resources of the community. Hamilton currently belongs to the Hamilton-Essex-Manchester Regional Health District so that any septic system maintenance program, whether informational or mandatory should be considered for implementation in the entire health district. Any regional septage disposal configuration should be viewed for administrative and operational consistency with the regional health district.

The town planning board, in conjunction with the conservation commission, should evaluate the land use recommendations with respect to existing land use and natural features information in the community. The MAPC can provide some preliminary data and technical assistance in this effort. Zoning changes, consistent with the preventive land control recommendations presented above and with local goals and policies, should be developed and presented for town meeting approval.

HAMILTON: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts.
 - II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
 - III. Social Impacts
 - A. Open Space and Recreation
 - B. Archaeological and Historic
 - C. Housing
 - IV. Economic Impacts
 - A. Manufacturing
-

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate. The impact on the tax rate is included to indicate how the capital cost might affect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6% and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost would be \$1,700 for Hamilton (not including stormwater costs), and this would result in an annual impact on the local tax rate of \$0.13. The annual operation and maintenance cost would be \$11,400.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining possible effects on erosion of future growth for Hamilton, there appear to be slight impacts with only 50 acres being potentially impacted. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of the anticipated future development in terms of potential flood control problems, it appears that moderate impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas. The extent of flood control problem areas in Hamilton appears to be 110 acres.

The adoption of the recommended buffer district would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The land use control recommendations for Hamilton appear to have positive impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

A positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist as well as clustering, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of these development patterns.

Other positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as the buffer district. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations constitute a small amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact. However, the extent of the wildlife habitat potentially affected is about 225 acres.

The use of a buffer district around Chebacco Lake, as recommended, would provide a benefit for wildlife. The development constraints imposed by this regulation would provide local benefits for as long as the regulation was in effect.

E. Air Quality Impacts. It is anticipated with the growth patterns projected as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. Therefore, impacts on air quality would be negligible.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Hamilton would be slight with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents.

In Hamilton, several scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts there is a strong positive relationship between this short-term use of the man-made environment and the enhancement of the long-term productivity of the environment.

In several places in Hamilton, where open space could be affected by development, the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, commercial, or moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open

space would be minimized through the development of less intensive land uses and would be more compatible with open space.

B. Archaeological and Historic Impacts. A review of the potential impacts on existing archaeological and historic sites in Hamilton indicates that future growth pressures would create negative impacts on a couple of sites. These sites are either zoned for moderately low or low residential development; or they are adjacent to such uses. Certainly when a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss of any of the archaeological or historic sites would be regional in significance.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth in terms of the amount of land available in the community. The projected 730 housing units anticipated for Hamilton mean that about 600 acres of residential land will be developed over the 20-year period.

Hamilton allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the outlined environmental zoning districts, which would either prohibit or constrain housing development, occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle-income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. There is no water-intensive manufacturing employment in Hamilton, but 120 such jobs are expected by 1995. While this figure accounts for 40 percent of all manufacturing in that year, it is only one percent of total projected 1995 employment in Hamilton. It is presumed that water-intensive manufacturing firms existing in 1995 will have met water quality requirements. However, Hamilton does not have enough land available (according to current zoning) to accommodate this projected 1995 growth.

Nevertheless, as 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

MIDDLETON: RECOMMENDED 203 PLAN

I. WASTEWATER TREATMENT

Middleton is presently served entirely by on lot sewage disposal systems. As a result of preliminary basin report findings, the town has applied for federal funds to conduct a 201 facilities planning study. This is certainly a step in the right direction. There is no need for extensive sewerage in the town. Nevertheless, areas with chronic septic system problems might be suitable for sewerage. These areas include the following:

- 1) Central Street and Washington Street area near the Howe Manning School;
- 2) Route 114 near the intersection with Essex Street;
- 3) Brigadoon Village area;
- 4) Route 62 south of South Main Street;
- 5) Hilldale Street area;
- 6) Maple Street and Liberty Street area;
- 7) John Avenue area near Mill Pond;
- 8) Arrow Street area.

While the 201 study is being conducted, the town should enforce a strict inspection and maintenance program for on-lot sewage disposal systems. Some systems might require reconstruction. Septic tanks should be pumped out regularly and septage should be disposed of in a proper manner.

II. STORMWATER MANAGEMENT

Operation and maintenance consisting of annual catch basin cleaning is done by the Highway Department. Based on the preceding discussion, the following recommendations are made to the town:

- Effort should be made by the town to update its data base on the location and characteristics of stormwater drainage systems located within the town for which plans have not been maintained.
- In site planning for future land development, maximum use should be made of natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

Average annual local costs are as follows:

(1) Sewerage	\$202,000	(minimum sewer extension)
(2) Septage Treatment	5,900	
(3) Stormwater	49,900	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

One industry in Middleton has been identified as a significant discharger. USM Corp. - Chemical Division has been issued an NPDES permit for the discharge of treated sanitary and process wastewaters and cooling water to the Ipswich River.

Recommendations to the town include the following:

- 1) Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public wells.
- 2) Water conservation and recycling of process wastewaters should be encouraged.

V. NON-POINT SOURCES

A. Landfills. The existing Middleton landfill exhibited a range of serious problems including location in the floodplain near the Ipswich River over a high yield aquifer with seasonal high water which saturated the base of the landfill. Operating practices were inadequate allowing additional leachate formation. The landfill should be closed as soon as an alternate means of disposal can be found.

The landfill site should be re-graded at closing, covered with impervious material and topped with two feet of compacted and seeded loam to prevent future infiltration.

Careful monitoring at the site, the river and downstream wells should be used to evaluate the effectiveness of this effort and to indicate whether additional protection is needed.

The planned future landfill at an adjacent site should be carefully developed and operated to prevent a repeat of past problems. Monitoring should be continual from the outset to check operating conditions.

A former private dump for demolition materials was closed in 1976 after problems with fires. It is on a high yield aquifer and it should be carefully sealed to prevent infiltration and potential contamination of groundwater.

Two unassigned dumps closed by the Board of Health in recent years were adjacent to wetlands. Both should be monitored to protect the water supply in Middleton Pond.

Middleton should consider regional resource recovery as its disposal option after exhaustion of the new landfill site.

B. Salt Storage and Application. Middleton stores road salt in an uncovered pile near Middleton Pond Reservoir. Careful monitoring is recommended and a covered shed with an impervious floor provided if contamination is found beyond the site.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Those portions of Emerson Brook and Boston Brook not included in Middleton's conservancy district should be protected either by extending the existing zoning district, or by adopting a new stream buffer district of at least 100 feet from each brook's banks.

Middleton should increase the minimum distance of 25 feet between septic systems or leaching fields and watercourses or bodies of water permitted under its local health code. (Under Title V of the State Environmental Code, this distance must now be at least 50 feet, although it can be more, as local conditions warrant.)

Zoning districts that allow for intensive commercial and industrial uses or relatively dense residential development, which conflict with the environmental capability of the land to support those uses should be rezoned to allow only low density residential development unless sewers are constructed.

VII. MANAGEMENT

It is recommended that Middleton continue towards the development of a 201 facilities plan for the town. Wastewater management recommendations would, of course, be contingent upon the recommendations of such a plan. Management options range from connection to the SESD (requiring the amendment of Chapter 190 of the Acts of 1972), to constructing a town-owned treatment facility, to

entering into an intermunicipal agreement for sewer service with a neighboring community, such as North Reading.

The Board of Health should initiate rigorous maintenance and inspection programs for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems.

In conjunction with the 201 study, which should evaluate the septage disposal problem, should be a consideration of a mandatory inspection and maintenance program for the community. Such a program could take many forms (see Part II of this plan), and should be a prompt consideration of a regional board of health depending upon the economies of scale, and the local political feasibility. Such a regional entity should be consistent with any proposed regional septage disposal configuration.

The town Planning Board, with the Conservation Commission, should study the land use recommendations presented above in terms of any more detailed land use and natural features information available in the community. Zoning changes, consistent with the preventive land control recommendations presented above and with local policies and goals, should be prepared and presented for town meeting approval.

MIDDLETON: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
- II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
- III. Social Impacts
 - A. Open Space and Recreation
 - B. Archaeological and Historic
 - C. Housing
- IV. Economic Impacts
 - A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance costs will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of Middleton. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6 percent and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost would be \$102,800 for Middleton (not including stormwater costs), and this would result in an annual impact on the local tax rate of \$4.07. The annual operation and maintenance cost would be \$105,100.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for Middleton, there appear to be both positive and negative impacts. Potential erosion problems could occur in areas of steep slope, erodible soils or sparse vegetation.

In those areas where the use of sewer service has been recommended as a solution for water quality, erosion problems would be aggravated for those potential erosion lands, but this would be short-term in duration.

A short-term negative impact of using sewers in an area considered as having erosion potential is that during the construction phase of work there would be considerable disruption of the landscape. This removal of natural vegetation, plus the increased traffic for the construction work, would mean an increase in the potential for erosion.

Different effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect and would be a long-term consequence.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effects.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that slightly positive impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extension of the conservancy district or the adoption of a stream buffer district would have a positive effect on flood control problems. This type of regulation would serve to reduce or prohibit development in areas with potential flood control problems. This benefit would continue as long as the regulation is in effect.

More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for Middleton appear to have positive and negative impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Sewers in areas of groundwater favorability could mean that the water used in these areas would no longer be recharged to the ground; rather it would be carried out of the community, thereby greatly reducing groundwater recharge in these areas. Negative effects could result on the recharge capacity of these areas and also present contamination problems through infiltration. This can be seen as long-term impact, since any effects created would continue to occur throughout the lifetime of that development. Due to the low probability of reversing this type of effect once it is established, this impact could constitute an irreversible commitment of groundwater resources. The results of a negative impact might not be limited to a single area or community, since many communities utilize groundwater supplies common to more than a single town.

However, some positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as floodplain and wetland overlay districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully address these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations constitute a moderate amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low and moderately low density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The extension of the conservancy districts in Middleton (or adoption of a stream buffer district) would provide a benefit for wildlife. The development constraints imposed by this land use regulation would provide local benefits for as long as the regulation was in effect.

E. Air Quality Impact. It is anticipated with the growth patterns projected in the recommendations as a continuation of existing trends, that the

ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the recommendations will have a negligible impact on air quality.

One short-term effect which would be very localized in significance would be that the level of particulate matter in the atmosphere would be expected to rise temporarily during the construction phase of the sewerage expansion because of the truck transportation of materials and supplies to and from the construction sites.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Middleton would be slight with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents. In one area in the town, a moderately size open space parcel is surrounded by land zoned for industrial use. Impacts from this type of development on open space could be slightly negative, long-term, but primarily of local importance.

In Middleton, several scattered public and semi-public lands fall within existing and recommended environmental zoning overlay districts. The additional development constraints contained in the conservancy district would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay district remains in force and would be an impact of local significance. In the case of this overlay zoning district, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

In several places in Middleton where open space could be affected by development, the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, commercial or moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased, according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. Existing archaeological and historic sites are located in areas already developed, therefore, there would be no additional impacts.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on other archaeological or historic sites not already identified and those should be addressed in the environmental assessment which could be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 600 housing units anticipated for Middleton means that about 670 acres of residential land will be developed over the 20-year period.

Middleton allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing. The process of cleaning up area waterways and water bodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is necessary to determine the potential impact of these costs upon such manufacturing establishments. Because cost impacts ultimately will affect jobs, it is important to estimate what firms may be most affected by the requirement of the water quality plan.

The recommendations for Middleton represent little reliance on structural solutions to water quality problems, and as a result it would seem that opportunities for employment in manufacturing would be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

Middleton has about 240 jobs in water-intensive employment, which is expected to increase to 450 jobs by 1995. As a percentage of total employment, this is about 18 percent.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

NORTH READING: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

Presently the town does not have any municipal sewers and also no need for townwide sewerage has been assessed. However, some minimal sewerage might be necessary in certain problem areas. It is recommended that:

- 1) The town should initiate a 201 facilities planning study to evaluate non-structural and structural solutions to abate present and future water quality problems.
- 2) The 201 facilities plan should study the possibility of a package treatment plant with limited local sewerage to serve the western shore area of Martins Pond and the Marshall Street-Hickory Lane area.
- 3) The 201 study should also address the problem of septage disposal, including town and regional alternatives.
- 4) The town should enforce a strict inspection and maintenance program for on-lot sewage disposal systems. Maintenance should include regular periodic pumping of septic tanks and septage should be disposed of in a proper manner.

II. STORMWATER MANAGEMENT

The Highway Department currently performs catch basin cleaning once a year. Recommendations to the town are:

- Inspections of both catch basin and outfall should be undertaken by the Highway Department to determine: (a) the need for more frequent catch basin cleaning; and, (b) the need for outfall and stream maintenance at the same time as (a) above.
- A study should be undertaken in the Skug River-Martins Pond drainage area to develop solutions to the flooding problems which occur in those areas due to inadequate pipe sizes, topography or both. Any solution investigated should be multi-purpose in nature, addressing both the flooding problem and the water quality of the receiving water.
- In site planning for future land development, maximum use should be made of natural drainage, the existing drainage systems, and non-structural runoff control measures.

III. ESTIMATED COSTS

Average annual local costs are as follows:

- | | | |
|-----------------------|----------|---|
| (1) Sewerage | 0 | |
| (2) Septage Treatment | \$21,600 | |
| (3) Stormwater | 90,100 | (much of this cost already may be in local budgets) |

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

The Beckwith Laminar Corp. has been identified as a significant industry because this firm may discharge to a water course without an NPDES permit. More information on this firm is needed.

Recommendations to the town include the following:

- 1) Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public water supplies.
- 2) Water conservation and recycling of process wastewaters should be encouraged.

V. NON-POINT SOURCES

A. Landfills. North Reading's solid waste is hauled to a private regional landfill in Billerica out of the Ipswich Basin. No pollution from landfill leachate has been identified in the town.

B. Salt Storage and Application. Both state and local road salt piles are stored in covered sheds with impervious floors and neither should threaten water contamination if the sites are well maintained.

The town has reduced salt use in recent years with some reflection in the drinking water chloride levels. However, the following program to prevent salt contamination is recommended to all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.

- Training of highway crews in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI . PREVENTIVE LAND USE CONTROLS

North Reading has relatively large areas of high groundwater favorability subject to considerable pressures for future development. An aquifer recharge protection district should be adopted in those areas.

In addition, some of the areas should be rezoned for low density residential development and/or clustering. The idea is to minimize interruption of the aquifer's recharge function by controlling the siting of structures and other impervious surfaces. However, soils for on-lot sewage disposal or communal subsurface systems must be adequate in the area proposed for clustered development, otherwise sewerage of some sort would be needed. Other areas should be rezoned because of severe soils limitations for on-lot sewage disposal.

In the future, North Reading should consider further protection of its streams, ponds and reservoirs by enacting a stream/pond buffer district or watershed protection district.

VII MANAGEMENT

North Reading town meeting should authorize the initiation of a 201 facilities planning study to evaluate both non-structural and structural solutions for present and future water quality problems.

If package plants are recommended to serve certain problem areas, such as Martin's Pond and the Marshall Street-Hickory Lane area, the establishment of a sewer commission to manage such facilities is recommended.

The 201 facilities study should also consider septage disposal. Management options range from contracting with the SESD, a town-owned and operated facility or a regional septage disposal facility with intermunicipal agreements between the participating towns (possibly Middleton and Lynnfield).

The North Reading Board of Health should initiate vigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems. In conjunction with the 201 study, evaluation of the septage disposal problem should be a consideration of a mandatory inspection and maintenance program for the community. Such a program could take many forms (see Part II of this plan), and should prompt consideration of a regional board of health depending upon the economies of scale, and the local political feasibility. Such a regional entity should be consistent with any proposed regional septage disposal configuration. The Board of Health should also monitor industries in the community to insure that state regulations are being complied and that public nuisance conditions are not present.

Finally, the town Planning Board, in conjunction with the Conservation Commission and the Board of Health, should evaluate the preventive non-point source control recommendations presented above with respect to existing land use and natural features information in the community. Zoning changes, consistent with these recommendations, should be drafted and presented to town meeting. Other community goals and policies should, of course, be reflected in these proposals.

NORTH READING: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
 - II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
 - III. Social Impacts
 - A. Open Space and Recreation
 - B. Archaeological and Historic
 - C. Housing
 - IV. Economic Impacts
 - A. Manufacturing
-

I. DIRECT COST IMPACTS

In the final analysis cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of North Reading. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6 percent and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost would be \$2,800 for North Reading for septage treatment. This would result in an annual impact on the local tax rate of \$0.04. The annual operation and maintenance cost would be \$18,800. The cost of stormwater management may already be largely in the local budget and the federally funded 201 study will determine the costs for structural wastewater treatment, if needed.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for North Reading, there appears to be slightly positive impacts. Potential erosion problems could occur in areas of steep slope, erodible soils, or sparse vegetation.

In those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area, potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

The amount of potential erosion areas affected by the recommendations in North Reading appears to be approximately 30 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that slightly positive impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The recommended zoning changes would result in low or moderately low residential density development which would not create a flood hazard that more intensive or dense uses could.

The extent of the reduction in flood control problem areas appears to be about 30 acres in North Reading. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for North Reading appear to have positive impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Positive effects on groundwater could accrue with the adoption of an aquifer protection district and the use of cluster zoning. By minimizing or clustering any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of other recommended land management controls. Revised land use controls

would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully address these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations constitute moderate amounts of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low and moderately low density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The adoption of an aquifer protection district in North Reading would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation is in effect.

The amount of potential wildlife habitat effected by these recommendations appears to be 250 acres.

E. Air Quality Impact. It is anticipated with the growth patterns projected in the recommendations, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the recommendations will have a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in North Reading would be slight with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderately residential. Development of this density could result in more use of existing open space and recreation areas by the residents.

In several places in North Reading where open space could be affected by development, the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, commercial, or moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased, according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. A review of the potential impacts of the recommendations on existing archaeological sites in North Reading indicates that the growth pressure would create negative impacts on only a few sites. These few sites are either zoned for moderately high residential or commercial development; or they are adjacent to such uses. Certainly when a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss of any of the archaeological sites would be regional in significance.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 1100 housing units anticipated for North Reading means that about 1000 acres of residential land will be developed over the 20-year period.

North Reading allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing units, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional, as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

However, the outlined environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of this town, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle-income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing. The process of cleaning up area waterways and water bodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is necessary to determine the potential impact of these costs upon such manufacturing establishments. Because cost impacts ultimately will affect jobs, it is important to estimate how manufacturing would be affected by the requirement of the water quality plan.

It can be seen that the recommendations would have potentially negative impacts on manufacturing.

The recommendations for North Reading represents reliance on non-structural solutions to water quality problems and as a result it would seem that opportunities for employment in manufacturing would be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

North Reading has 24 jobs in water-intensive employment, which is expected to increase to 134 jobs by 1995. As a percentage of total employment in 1995, this is about three percent.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

READING: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

Reading is 85% sewerred and the town expects all of the present population to be sewerred by 1980. No recommendation beyond these plans is necessary.

There are some surcharging problems related to the collection system in Reading. A relief sewer is planned for construction from the western side of Reading to the MSD system in Woburn. This relief sewer will be able to accomodate half of Reading's wastewater and is expected to alleviate present surcharging conditions.

II. STORMWATER MANAGEMENT

The Highway Department is responsible for the operation and maintenance of the stormwater system. Catch Basins are cleaned at least twice per year. Additionally, culverts and ditches are cleaned as needed to prevent flooding. Recommendations to the town are:

- A program of outfall and receiving stream inspection and maintenance should be developed and implemented.
- In site planning for future land development, maximum use should be made of existing drainage systems, natural drainage patterns, and non-structural runoff control measures (in areas where no drainage system presently exists).

III. ESTIMATED COSTS

(1) Sewerage	0	
(2) Septage Treatment	0	
(3) Stormwater Management	\$129,650	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

One company in Reading has been identified as a significant industry. The General Tire and Rubber Co. has a permit application pending for discharges to the Saugus River.

Recommendations to the town include the following:

- 1) The town should adopt a sewer use law that is comparable to

the model sewer use law developed by the MAPC. In addition a drain layer's manual should be adopted to regulate the installation of sewer connections.

- 2) New industries should be required to discharge sanitary and process wastewaters (with pretreatment, if required) to the sewer system. Water conservation and recycling of process wastewaters should be encouraged.

V. NON-POINT SOURCES

A. Landfills. The current ash disposal site for the Reading incinerator is in a filled wetland area and it exhibited poor operating practices during a staff visit. It is nearing capacity and it should be carefully closed, sealed, and planted according to DEQE regulations.

Because of the nearby wetland and moderate to high yield aquifers, the site should be monitored as part of the town's scheduled water survey. Periodic monitoring should follow the sealing of the site to assess the effectiveness of the sealing and to detect any threat to the Wakefield well site.

If the incinerator is to be used beyond the closing of the current ash disposal site, a new site should be chosen without the water quality problems caused by wetlands, aquifers, and nearby streams. Operation at the new site should be improved to prevent leachate generation.

B. Salt Storage and Applications. A poorly protected state road salt depot at Causeway Road may be partly responsible for serious contamination levels at Reading's REVAY Meadows wells. Immediate monitoring of the site should be undertaken and a covered shed with an impervious floor should be built (or the salt moved) if contamination is found beyond the site.

Heavy road salting on state and local roads appears to be contributing to the exceptionally high chloride levels at Reading's Hundred Acre Meadow and REVAY Meadow wells. Town crews avoid salting near wells; however, the following comprehensive program, at a minimum, should be instituted immediately by all state and local highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Part of northwestern Reading is classified as an area of high groundwater favorability. In conjunction with the existing zoning of single-family lots of 40,000 square feet in the area, provisions for clustered residential developments along with contingent site plan review powers should be adopted.

Reading should also consider for the future additional protection of its water resources by enacting an aquifer recharge district or a stream/pond buffer district, for example.

VII. MANAGEMENT

Since no recommendations are being made for Reading with respect to wastewater treatment, no corresponding management recommendations can be made. However, because the community is connected to the MSD, the community will be required to implement and maintain a user charge and industrial cost recovery billing and collection system which must be approved by the MDC and EPA. Additionally, once MDC promulgates presently proposed rules and regulations covering discharge of sewage, drainage, substance of wastes to the MSD system, communities will be required to have in effect a sewer use by-law or ordinance no less stringent than the regulations of the MDC. These requirements will place significant administrative and management burdens on Reading. Reference should be made by Reading to the model sewer use ordinance and drain layer's manual presented in this plan.

The Board of Health should monitor the ash disposal site for the town's incinerator to insure compliance with state landfill operating regulations. Water quality monitoring of this area should be included in the town's water survey. To plan for future solid waste disposal the town should form a regional refuse disposal planning committee.

The Board of Health should oversee monitoring to determine sources of chloride contamination of town wells. Non-local activity contributing to such contamination should be reported to the appropriate state agencies (DEQE and DPW).

The town Board of Survey, with the Conservation Commission and the Board of Health, should evaluate the preventive non-point source control recommendations presented above with respect to existing land use and natural features information in the community. Zoning changes, consistent with these recommendations, should be drafted and presented to town meeting. Other community goals and policies should, of course, be reflected in these proposals.

READING: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
- II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
- III. Social Impacts
 - A. Open Space and Recreation
 - B. Archaeological and Historic
 - C. Housing
- IV. Economic Impacts
 - A. Manufacturing

I. DIRECT COST IMPACTS

No direct costs are anticipated in Reading as a result of the sewerage and septage treatment recommendations in this plan. Much of the cost identified for stormwater management may already be in the local budgets.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining possible effects on erosion with future development for Reading, there appear to be moderate impacts with approximately 80 acres that could have erosion problems. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

B. Flood Control Impacts. When assessing the potential effects of the anticipated growth to 1995 in terms of potential flood control problems, it appears that moderate impacts could result. Lands with potential flood control problems are considered to the wetlands, flood hazard areas, and steep slope areas.

The extent of the flood control problem areas appears to be about 200 acres in Reading.

C. Groundwater Impacts. Impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability, would be slight with

development according to existing growth trends. Most of these areas fall within the existing environmental zoning district which serves to protect the town's well sites. In addition, the use of clustering and the adoption of an aquifer protection district as recommended would serve to further protect areas of high groundwater favorability. These positive impacts would continue as long as these land use regulations are in effect.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future development constitute a moderate amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The use of environmental overlay zoning in Reading, such as an aquifer protection district, would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

E. Air Quality Impacts. It is anticipated with the growth projected for Reading, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the impacts on air quality would be negligible.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Reading would be moderate with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents. In a few areas in the town, along Route 93, small open space parcels are adjacent to or surrounded by land zoned for industrial use. Impacts from this type of development on open space could be slightly negative, long-term, but primarily of local importance.

In Reading, several scattered public and semi-public lands fall within existing and recommended environmental zoning overlay districts. The additional development constraints contained in these floodplains, wetlands, or aquifer protection districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the

manmade environment and the enhancement of the long-term productivity of the environment.

B. Archaeological and Historic Impacts. There are no known archaeological or historic sites in Reading.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in terms of the amount of land available in the community. The projected 2268 housing units anticipated for Reading means that 1200 acres of residential land will be developed over the 20-year period.

Reading allows moderate amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and, obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

In addition, the environmental zoning districts, which would either prohibit or constrain housing development, occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

These factors would combine to affect a moderate amount of land, and may reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle-income families may become more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing. Reading has 131 jobs in water-intensive employment, which is expected to increase to 220 jobs by 1995. As a percentage of total employment, this is only 3 percent. Although growth of water-intensive manufacturing employment would seem to indicate ability of these firms to remain competitive while adhering to water quality standards, reference should be made to the EMMA Study for a discussion of industrial employment impacts in MDC-served towns, of which Reading is one.

TOPSFIELD: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

Recommendations for Topsfield include:

- Maintain on-lot septic systems as the town-wide wastewater management system.
- That the town develop and implement a maintenance and inspection program to ensure the continued viability of septic systems as the town's wastewater treatment system.
- That the town initiate a 201 facilities plan to evaluate local and regional septage treatment and disposal alternatives. Regional alternatives should include the towns of Hamilton and Wenham. A complete environmental impact statement should be developed as an integral part of the facilities plan.

The basis for these recommendations comes from the Preliminary Basin Report for the Ipswich River and the 208 Septage Report and the public preferences stated by the local officials and citizens during the public review of these reports. There is insufficient evidence to justify the construction of a town-wide sewer system based on water quality and/or public health concerns.

II. STORMWATER MANAGEMENT

Plans of the stormwater collection system have not been maintained by the town. However, CDM was able to identify eight stormwater systems through verbal communication with the Highway Superintendent. Of these eight systems, three result in discharges to Fish Brook, two to Mile Brook, two discharge to the Ipswich River, and one discharges to an unnamed tributary to the Ipswich. Seven of these systems range from 10 to 37 acres in size, with one system draining 90 acres.

Catch basin cleaning is done twice a year by the town's Highway Department. Stream and culvert maintenance is also done at the same time. As stormwater is not considered to be a problem in Topsfield at this time, recommendations are limited to the following:

- In site planning for future land development, utilization of natural drainage and non-structural runoff control measures should be maximized.

III. ESTIMATED COSTS

(1) Sewerage	0	
(2) Septage Treatment	\$12,200	
(3) Stormwater	68,250	(much of this cost already may be included in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

No significant industries have been identified in Topsfield. Recommendations to the town include the following:

- 1) Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public water supplies.
- 2) Industries should be encouraged to practice water conservation and to recycle their process wastewaters.

V. NON-POINT SOURCES

A. Landfills. No problems have been reported by either the town or DEQE caused by the town's sanitary landfill.

B. Salt Storage and Application. Topsfield stores municipal road salt at the School Street depot without protection from precipitation. A small brook draining the area flows to the Ipswich River about 5,000 feet south. No wells are threatened by the storage facility. Water quality data from the brook is not presently available. It is recommended that the town provide a covered shed with an impervious floor for the present salt storage site to protect ground and surface waters from salt contamination.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Much of the aquifer recharge area which protects the high yield groundwater supply underlying Topsfield is already zoned for single-family lots. A cluster or PUD option should be adopted in these zoning districts, along with the contingent site plan review powers. The idea is to minimize interruption of the aquifer's recharge function by controlling the siting of structural and other impervious surfaces. However, soils for on-lot sewage disposal or

or communal subsurface systems must be adequate in the area proposed for clustered or planned residential development.

In the future Topsfield should consider additional protection of its water resources in the form of a stream/pond buffer district or watershed protection district.

VII. MANAGEMENT

It is recommended that town meeting in Topsfield approve the initiation of a 201 facilities plan to evaluate local and regional septage treatment and disposal alternatives. The recommendations of such a plan may require other management actions for the community such as an intermunicipal septage disposal agreement with a neighboring community such as Wenham or Hamilton.

The Board of Health should initiate a rigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems.

In conjunction with the 201 study evaluation of the septage disposal problem should be a consideration of a mandatory inspection and maintenance program for the community. Such a program could take many forms (See part II of this plan), depending upon the resources and goals of the community. The town of Topsfield currently belongs to the Boxford-Topsfield-Wenham Health District. Any septic system maintenance program, whether strictly informational or calling for mandatory maintenance, should be considered for implementation in the entire health district. In 1974 the Boxford-Topsfield-Wenham Health District did prepare an article on septic tank maintenance which was printed in the 1974 Topsfield Annual Report, and which did, apparently, influence homeowner maintenance. Any regional septage disposal configuration should be viewed for administrative and operational consistency with the Regional Health District. A septage disposal arrangement with Wenham would therefore be consistent with this recommendation.

The Topsfield Planning Board, working with the Conservation Commission and the Board of Health should consider the land use recommendations made above. Land use and natural features information which is more detailed than the MAPC information should, of course, be referred to. A more detailed delineation of the aquifer recharge area in the community would be desirable, and town meeting should be asked to authorize such a study. Zoning changes, consistent with the preventive land control recommendations presented above, and with local goals and policies, should be developed and presented for town meeting approval.

TOPSFIELD: IMPACT ASSESSMENT

Categories

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one concept over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of Topsfield. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included for each concept, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6% and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service

cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost for Topsfield would be \$1600 and this would represent a \$0.02 annual change in the tax rate. Annual operating and maintenance costs would be \$10,600.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for Topsfield there appear to be moderately negative impacts. Potential erosion problems could occur in areas of steep slope, erodable soils or sparse vegetation.

Different effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect and would be a long-term consequence.

The amount of potential erosion areas affected by the recommendations in Topsfield appears to be approximately 360 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

Currently, there are approximately 400 acres of land in Topsfield, which are subject to significant growth pressures. As scattered low density residential development continues, flood control could occur. However, the use of clustering as recommended would help to minimize potential flood control problems.

C. Groundwater Impacts. The wastewater solutions recommended for Topsfield appear to have positive impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as Topsfield's Conservancy Districts. Because this environmental district impose special constraints on development, it also functions, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean clustering as well as lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental impact statement should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations do constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The amount of potential wildlife habitat found in Topsfield is approximately 4700 acres. The continuation of growth as low density type of development which has been occurring up to now means that urban development is dispersed across the community.

One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitat.

The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

E. Air Quality Impacts. It is anticipated with the growth patterns projected in the recommendations as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the recommendations will have a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Topsfield would be slight with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents. In Topsfield several scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in the conservancy district would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

However, it also should be noted that where the permitted residential density would be decreased according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for recreation.

In several places in Topsfield where open space could be affected by development the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, commercial, or moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

B. Archaeological and Historic Impacts. A review of the potential impacts of the recommendations on existing archaeological and historic sites in Topsfield indicates that the growth pressure would create moderately negative impacts on only a few sites. These few sites are zoned for moderately low or medium density residential development; or they are adjacent to such uses. Certainly when a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss of any of the archaeological or historic sites would be regional in significance.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the Environmental Impact Statement which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 950 housing units anticipated for Topsfield means that 1260 acres of residential land will be developed over the 20-year period.

Topsfield appears to be capable of accommodating the expected residential demand.

Topsfield allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in this community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of Topsfield, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is necessary to determine the potential impact of these costs upon such manufacturing establishments. Because cost impacts ultimately will affect jobs, it is important to estimate what firms may be most affected by the requirement of the water quality plan.

The recommendations for Topsfield represent no reliance on structural solutions to water quality problems and as a result it would seem that opportunities for employment in manufacturing would be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

WENHAM: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

The town of Wenham does not have any municipal sewers. No need for town-wide sewerage has been assessed. There are no identified septic system problem areas except one or two areas where corrective action has been taken by the town. Gordon College, which has expanded its campus, plans to connect to the South Essex Sewerage District (SESD). Sewering is not needed for this town; however, it is recommended that the town should:

- 1) Enforce a strict inspection and maintenance program for on-lot disposal systems to prevent any potential problems. Septic tanks should be regularly pumped out at least once in two or three years.
- 2) Initiate a 201 facilities plan to evaluate alternatives for septage treatment and disposal. The town can either construct its own septage treatment facility or could join a regional treatment facility that could serve the towns of Topsfield, Hamilton, and Wenham. Other options should also be evaluated by the facilities plan.

II. STORMWATER MANAGEMENT

Stormwater runoff is not considered to represent a threat to water quality in Wenham, as it is essentially still unurbanized in character. No plans of the stormwater system in town have been maintained. The Highway Department is responsible for the operation and maintenance of the stormwater collection system. The department flushes plugged lines in the spring. A private contractor is hired to clean catch basins in problem areas twice a year. Recommendations to the town are:

- The town should initiate a program of identifying problem areas requiring catch basin cleaning and of identifying the outfall and receiving stream associated with problem catch basins.
- Care should be taken to capture solids flushed from drain lines during the town's spring flushing program in order to prevent slug loads from building up and settling in receiving streams. Receiving streams should be inspected, solids deposited from past flushing activities should be cleaned out, and other channel maintenance should be performed as necessary.
- In site planning for future land development, maximum use should be made of natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

- (1) Sewerage
- (2) Septage Treatment \$ 7,000
- (3) Stormwater Management \$47,200 (much of this cost already may be
in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

No significant industries have been identified in Wenham.

Recommendations to the town include the following:

- 1) Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public water supplies.
- 2) Industries should be encouraged to practice water conservation and to recycle their process wastewaters.

V. NON-POINT SOURCES

A. Landfills. No water quality problem related to landfill leachate was identified.

B. Salt Storage and Application. No water quality problems related to road salt storage practices were identified.

The following program to prevent road salt contamination is recommended to all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

The aquifer recharge area which protects the high yield groundwater supply underlying Wenham is currently zoned for single-family lots of one acre. A cluster option should be adopted, in this zoning district, along with the contingent site plan review powers. The idea is to minimize interruption of the aquifer's recharge function by controlling the siting of structures and other impervious surfaces. However, soils for on-lot sewage disposal or communal sub-surface systems must be adequate in the area proposed for clustered residential development.

In the future, Wenham should also consider enacting a stream/pond buffer district or a watershed protection district as further protection of its water resources.

VII. MANAGEMENT

The Wenham town meeting should approve the initiation of a 201 facilities plan to evaluate local and regional septage treatment and disposal alternatives. The recommendations of such a plan may require other management actions for the community such as an intermunicipal septage disposal agreement with a neighboring community such as Topsfield and/or Hamilton.

The Wenham Board of Health, acting in conjunction with the Boxford, Topsfield, Wenham Regional Health District, should initiate a rigorous maintenance and inspection program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems.

In conjunction with the 201 study evaluation of the septage disposal problem should be a consideration of a mandatory inspection and maintenance program for the community. Such a program could take many forms (see Part II of this plan), depending upon the resources and goals of the community. The town of Wenham currently belongs to the Boxford-Topsfield-Wenham Health District. Any septic system maintenance program, whether strictly informational or calling for mandatory maintenance, should be considered for implementation in the entire health district.

The Wenham Planning Board, working with the Conservation Commission and the Board of Health should consider the land use recommendations made above. Land use and natural features information which is more detailed than the MAPC information should, of course, be referred to. A more detailed delineation of the aquifer recharge area in the community would be desirable, and town meeting should be asked to authorize such a study. Zoning changes, consistent with the preventive land control recommendations presented above, and with local goals and policies, should be developed and presented for town meeting approval.

WENHAM: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of Wenham. The impact on the tax rate is included to indicate how the capital cost might affect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6% and is the figure discussed in Part II Section 2. The "tax rate impact" shows the annual change in the community's tax rate due

to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost would be \$900 for Wenham (not including stormwater costs), and this would result in an annual impact on the local tax rate of \$0.02. The annual operation and maintenance cost would be \$6,100.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of projected growth for Wenham, there appear to be slight impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation. In Wenham, these areas amount to about 15 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of the anticipated development to 1995 in terms of potential flood control problems, it appears that slight impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extent of the flood control problem areas appears to be about 50 acres in Wenham. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The projected growth to 1995 for Wenham appears to have slight impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Many areas of high groundwater favorability fall within the town's flood-plain district which functions, to a certain extent, as groundwater protection because of the development restrictions contained in the regulation.

The use of clustering as recommended would also have a positive impact on groundwater by minimizing the interruption of the aquifer recharge function through the control of the siting structures and other impervious surfaces.

These impacts would remain as long as these regulations are in force and they would be regional in nature, since many communities utilize groundwater supplies common to more than a single town.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future growth constitute a moderate amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The use of a floodplain district in Wenham provides a benefit for wildlife. The development constraints imposed by these land use regulations would continue to provide local benefits for as long as the regulation remains in effect.

The amount of potential wildlife habitat affected by the anticipated growth appears to be about 250 acres.

E. Air Quality Impact. It is anticipated with the growth projected as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. Therefore, impacts on air quality would be negligible.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Wenham would be minimal with development as a continuation of existing growth trends to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderately low residential density. Development of this density could result in more use of existing open space and recreation areas by the residents.

In Wenham, several scattered public and semi-public lands fall within environmental zoning overlay districts. The additional development constraints contained in this floodplain district would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the man-made environment and the enhancement of the long-term productivity of the environment.

B. Archaeological and Historic Impacts. Impacts from future growth on any archaeological and historic sites in Wenham would be minimal, since the Claflin-Richards House is included in the Wenham Historic District. Development adjacent to this district would not be an incompatible use. However as the community undertakes 201 facilities planning, specific attention should be directed to possible effects on any other archaeological or historic sites

and should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 240 housing units anticipated for Wenham means that about 200 acres of residential land will be developed over the 20-year period.

Wenham allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a basin perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is necessary to determine the potential impact of these costs upon such manufacturing establishments. Because cost impacts ultimately will affect jobs, it is important to estimate how manufacturing would be affected by the requirement of the water quality plan.

The recommendations would have minimal impact on manufacturing in Wenham. Wenham has about 25 jobs in water-intensive employment, which is expected to increase to 140 jobs by 1995. As a percentage of total employment in 1995 this is about 17 percent.

WILMINGTON: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

Except for a small sanitary sewer system that is tributary to the MSD and that serves industries and a small number of residences in the southeastern corner of town, 97 percent of Wilmington's population is served by septic systems. Wilmington has recently voted major sewer extensions to serve the Silver Lake area, which was experiencing septic system problems, as well as some other small areas. Although no new recommendations are necessary concerning wastewater treatment, it is recommended that:

- The town should enforce a strict inspection and maintenance program for on-lot sewage disposal systems for the unsewered population.
- The maintenance program should include regular periodic pumping of septic systems as well reconstruction of septic systems when necessary.

II. STORMWATER MANAGEMENT

The Highway Department presently performs annual catch basin cleaning and stream maintenance programs.

Recommendations to the town include the following:

- In site planning for future land developemnt, maximum use should be made of the existing drainage systems, and the use of natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

- | | | |
|---------------------|-----------|---|
| - Sewerage | 0 | |
| - Septage Treatment | 0 | |
| - Stormwater | \$200,350 | (much of this cost already may be in local budgets) |

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Two significant industries have been identified in Wilmington. AVCO Systems Division has been issued an NPDES permit for cooling water and boiler blowdown discharges to Maple Meadow Brook. General Electric has been issued an NPDES permit for cooling water discharges to the Ipswich River.

Recommendations to the town include the following:

- The town should adopt a sewer use law that is comparable to the model sewer use law developed by MAPC. In addition, a drain layer's manual should be adopted to regulate the installation of sewer connections.
- New industries should be required to discharge sanitary and process wastewater (with pretreatment, if required) to the sewer system. Water conservation and recycling of process wastewater should be encouraged.
- Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public water supplies.

V. NON-POINT SOURCES

A. Landfills. The former Wilmington landfill was over an aquifer, near a wetland and had poor operating practices. It should be monitored after it is carefully closed and sealed to prevent future contamination.

B. Salt Storage and Application. Wilmington stores road salt at Federal Street uncovered on permeable material near marshland and about 2000 feet from the Ipswich River. A covered shed with an impervious floor should be constructed to prevent contamination.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Many large wetlands are currently unprotected by a separate zoning district in Wilmington. The town needs either to extend its present form of floodplain zoning to protect all wetlands, or to enact a separate wetlands district.

Nearly all of Wilmington serves as an aquifer recharge area for an area of high groundwater favorability. In conjunction with the existing low density residential district, the community should adopt zoning provisions for cluster developments along with expanded contingent site plan review powers. The idea is to minimize interruption of the aquifer's recharge function by controlling the siting of structures and other impervious surfaces. However,

soils for on-lot sewage disposal or communal subsurface systems must be adequate in the area proposed for clustering, otherwise sewerage of some sort would be needed.

Wilmington also needs to increase minimum lot sizes in certain areas because of severe soils limitations for septic systems.

Wilmington should increase the minimum distance of 25 feet between septic tanks or leaching fields and watercourses or bodies of water permitted under its local health code. (Under Title V of the new State Environmental Code, this distance must now be at least 50 feet, although it can be more, as local conditions warrant.)

VII. MANAGEMENT

With the exception of the extension of sewers to the Silver Lake area, already approved by the town, there are no major sewerage recommendations. However, because the community is connected to the MSD, the community will be required to implement and maintain a user charge and industrial cost recovery billing and collection system which must be approved by the MDC and EPA. Additionally, once MDC promulgates presently proposed rules and regulations covering discharge of sewage, drainage, substances or wastes to the MSD system, Wilmington will be required to have in effect a sewer use by-law or ordinance no less stringent than the regulations of the MDC. These requirements will place significant administrative and management burdens on Wilmington. Reference should be made by Wilmington to the model sewer use ordinance and drain layer's manual presented in this plan.

The Board of Health should initiate a vigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping, to the reconstruction of failing systems, to requiring connection to the municipal collection system when a septic system fails or becomes a nuisance. There should also be a consideration of a mandatory septic tank inspection and maintenance program for the community. Such a program could take many forms (see Part II, Section 5 of this plan) depending upon the goals and resources of the community.

Finally, the town planning board, in conjunction with the conservation commission, should evaluate the preventive non-point source control recommendations presented above with respect to existing land use and natural features information in the community. Zoning changes, consistent with these recommendations, should be drafted and presented to town meeting. Other community goals and policies should, of course, be reflected in these proposals.

WILMINGTON: IMPACT ASSESSMENT

Categories

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

There would be no direct cost impacts from wastewater treatment beyond the sewer extensions which the town has recently voted.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the projected growth pattern for Wilmington there appear to be some negative impacts. Potential erosion problems could occur in areas of steep slope, erodible soils, or sparse vegetation.

Positive effects would result in those areas where the intensity of permitted development would be reduced, in order not to conflict with the environmental capability of the land.

Potential erosion problems would be reduced in these areas, and this would be a positive effect and would be a long-term consequence.

The amount of potential erosion areas possibly affected by future growth appears to be approximately 150 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of the projected growth in terms of potential flood control problems, it appears that negative impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The expansion of a wetland/floodplain district would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

The extent of the flood control problem areas appears to be over 500 acres in Wilmington. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for Willington appear to have potentially positive impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as floodplain and wetland overlay districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the projected future growth do constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community.

One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The expansion of floodplain/wetland districts in Wilmington would provide a positive benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

The amount of potential wildlife habitats in Wilmington appears to be over 2500 acres.

E. Air Quality Impact. It is anticipated with the growth patterns projected that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that there will be a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Wilmington would be negligible with development according to the projected growth.

However, it also should be noted that where the permitted residential density would be decreased, according to the land development control recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. A review of the potential impacts of the recommendations on existing archaeological and historic sites in Wilmington indicates that the growth pressure would create negative impacts on only a few sites. Certainly if a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss of any of the archaeological or historic sites would be regional in significance.

Wilmington has three archaeological sites that possibly could be affected by development. One is in the northern section of town, partly in a developed area, and partly in a medium-low density residential zone. Another is in the south-central section, also in a medium-low density residential zone, and the third site is near Silver Pond in an area of medium density residential zoning.

There are two historic sites: the Harden Tavern is situated near a medium-low residential zone, and the Middlesex Canal, which is adjacent to industrial and low to medium-low density residential zones.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites.

The information used was made available to this project from the State Archaeologist's Office with this request.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the projected growth in terms of the amount of land available in the community. The projected 1200 housing units anticipated for Wilmington means that over 1400 acres of residential land will be developed over the 20-year period.

Wilmington allows a significant amount of relatively low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in these towns may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional, as well as a basin perspective, and at the regional level the potential problem becomes more apparent. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both basinwide and areawide. With more extensive use of protective districts in parts of the Basin, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle-income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing. The expansion and use of sewer service areas as voted by the town would allow opportunities for increased levels of manufacturing activities, and thereby increase employment levels. The principal reason for such an effect is that with the introduction of sewer service to industrial land, these areas could assimilate more structural development, which could then accept more labor-intensive economic activities. Indeed, the presence of sewerage might encourage some towns to rezone areas for industrial use, given the proper market, and other economic conditions.

NORTH COASTAL OVERVIEW

A. A PROFILE OF THE NORTH COASTAL BASINS

The North Coastal Basin is located in the northeastern quadrant of the MAPC 208 study area. The basin is bounded by the Atlantic Ocean on the east, the Ipswich River Basin to the northwest, and the Mystic River Basin to the southwest. Twelve communities lie largely or wholly within the North Coastal Basin. They are:

Beverly	Manchester	Salem
Danvers	Marblehead	Saugus
Lynn	Nahant	Swampscott
Lynnfield	Peabody	Wakefield

Six other communities contribute drainage to the North Coastal basin. These communities are discussed, however, in the context of other major basins to which they also drain. These communities and the basin section in which they can be found, are listed below:

Revere:	Mystic Basin Section
Everett:	Mystic Basin Section
Malden:	Mystic Basin Section
Melrose:	Mystic Basin Section
Stoneham:	Mystic Basin Section
Reading:	Ipswich Basin Section

The basin can be generally characterized as an established group of communities undergoing only slight growth. Residential land predominates in most basin communities, particularly higher density residential uses, although significant amounts of commercial and industrial land exist in some communities (particularly in the larger cities of Lynn, Peabody, and Salem).

Between 1950 and 1975 the population of the basin increased by 17 percent. According to MAPC projections, an additional increase in population of approximately 6 percent is projected to 1995, giving a total of 369,300 persons by that time.

The proximity of the basin communities to Routes 107, 127, 128 and 95, which link most of the basin to the rest of the metropolitan area, has enhanced the area's attraction as a highly desirable urban and suburban setting. In general, residence in the North Coastal Basin offers home ownership or attractive rental units with water-oriented living and easy access to regional employment and cultural centers.

Only moderate economic growth is expected within the basin during the 1975-1995 period. Overall, there is expected to be a 31 percent increase in employment, representing over 50,000 new workers by 1995, according to MAPC projections.

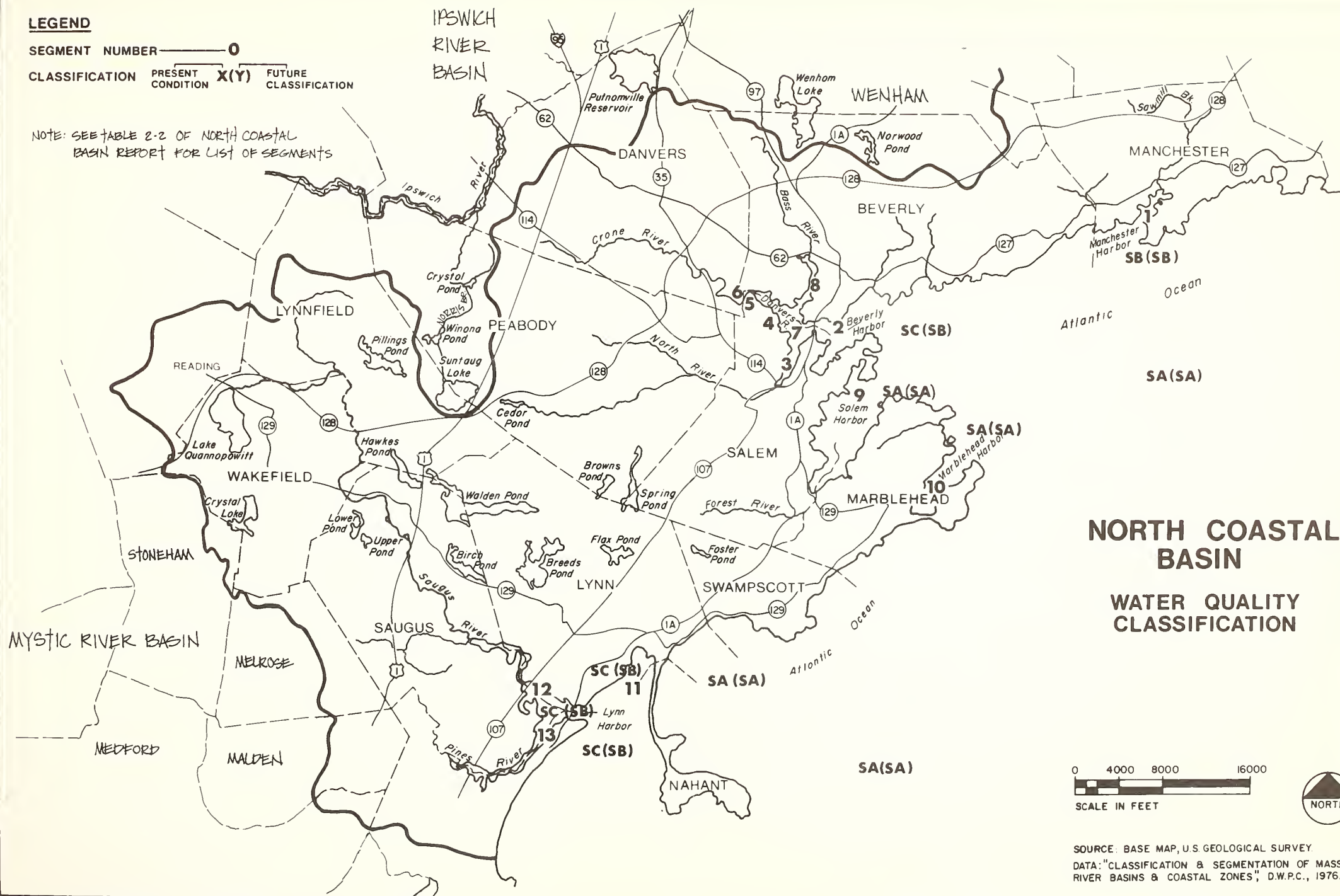
Land use data indicates that the housing stock consists of an even breakdown between single-family and multi-family units. The predominant lot sizes are approximately quarter-acre lots. Commercial development has occurred in "strip" fashion along major arterials, as well as in malls and downtown areas. Industrial development tends to be concentrated in certain communities and accounts for 12 percent of the total acreage within the basin.

LEGEND

SEGMENT NUMBER ——— 0

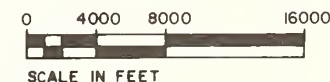
CLASSIFICATION PRESENT CONDITION X(Y) FUTURE CLASSIFICATION

NOTE: SEE TABLE 2-2 OF NORTH COASTAL BASIN REPORT FOR LIST OF SEGMENTS



NORTH COASTAL BASIN

WATER QUALITY CLASSIFICATION



SOURCE: BASE MAP, U.S. GEOLOGICAL SURVEY.
DATA: "CLASSIFICATION & SEGMENTATION OF MASS.
RIVER BASINS & COASTAL ZONES", D.W.P.C., 1976.

CHANGES IN COMMUNITY POPULATIONS AND PROJECTIONS: NORTH COASTAL BASIN*

AREA	1950 ¹	1960 ¹	% Δ '50 '60	1970 ²	% Δ '60 '70	% Δ '50 '70	1975 ³	1980 ⁴	1985 ⁴	1990 ⁴	1995 ⁴	% Δ '70-'95
BEVERLY	28,884	36,108	25.0	38,348	6.2	32.8	37,400	40,500	41,500	42,500	43,000	12.1
DANVERS	15,720	21,926	39.5	26,151	19.3	66.4	25,000	25,300	26,600	27,800	28,900	10.5
EVERETT	45,982	43,544	-5.3	42,485	-2.4	-2.3	39,800	38,700	38,400	38,300	38,300	-9.8
HAMILTON	2,764	5,488	99.0	6,373	16.0	72.6	6,700	6,900	7,500	8,100	8,600	34.9
LYNN	99,738	94,478	-5.3	90,294	-4.4	-9.5	80,200	78,700	78,400	78,400	78,300	-13.3
LYNNFIELD	3,927	8,398	114.0	10,826	28.9	175.7	12,000	12,900	13,800	14,400	14,800	36.8
MALDEN	59,084	57,676	-3.6	56,127	-2.7	-6.9	55,800	54,300	54,800	56,000	57,800	2.3
MANCHESTER	2,868	3,832	37.1	5,151	31.0	79.8	5,500	5,800	6,400	6,800	7,300	41.7
MARBLEHEAD	13,765	18,521	34.6	21,295	15.0	54.7	21,600	22,200	22,900	23,500	24,000	12.7
MELROSE	26,988	29,619	9.7	33,180	12.0	22.9	32,200	34,800	35,000	35,300	35,300	6.4
NAHANT	2,679	3,932	47.8	4,119	3.9	53.6	4,200	4,500	4,600	4,600	4,600	11.7
PEABODY	22,645	32,202	42.2	48,080	49.3	112.3	45,500	45,600	47,000	48,000	49,500	2.9
READING	14,006	19,259	37.5	22,539	17.0	35.3	23,700	26,000	27,800	29,500	30,500	35.3
REVERE	26,763	40,080	9.0	43,519	7.7	17.4	41,300	41,400	42,000	42,600	43,000	-0.4
SALEM	41,880	39,211	-6.4	40,556	3.4	-3.1	40,600	41,800	42,200	42,200	42,200	4.0
SAUGUS	17,160	20,666	20.4	25,110	21.5	46.3	24,800	24,300	26,500	27,800	29,200	16.3
SWAMPSCOTT	11,580	13,294	14.8	13,578	2.2	17.4	14,300	14,900	15,400	15,800	16,000	17.8
WAKEFIELD	19,633	24,295	23.7	23,402	4.6	29.4	26,000	28,500	30,000	31,000	31,500	24.0
WENHAM	1,644	2,798	70.0	3,849	37.6	134.1	3,400	3,500	3,800	4,200	4,700	22.1
TOTAL	457,710	515,327	10.2	556,622	8.0	21.6	577,800	550,660	564,600	576,800	587,500	5.5

1 U.S. Census of Population

2 U.S. Census of Housing

3 State Census

4 MAPC Projections

*Beverly, Danvers, Lynn, Lynnfield, Manchester, Marblehead, Nahant, Peabody, Salem, Saugus, Swampscott and Wakefield are the subject of the North Coastal Basin Report; Hamilton, Reading and Wenham are included in the Ipswich River Basin Report; and Everett, Malden, Melrose and Revere are included in other Basin Reports.

B. WATER QUALITY IN THE BASIN

Water quality in the immediate coastal waters ranges from good, class SB, to poor, class SC. The most serious and pervasive pollutant source in the basin is the continuing discharge of raw untreated sewage into the harbors and embayments. Presently, only two of the communities on the coast provide treatment for their sewage. Swampscott provides primary treatment and may be planning to upgrade to secondary treatment. Manchester operates a small secondary treatment plant. The South Essex Sewerage District collects the sewage from Beverly, Danvers, Peabody, Salem and Marblehead and discharges the material untreated into Salem-Beverly Harbor. A primary treatment plant is under construction, and plans are underway to add secondary treatment in the near future. Lynn, Nahant, and Saugus all discharge untreated sewage into Lynn Harbor and Nahant Bay through municipal discharges, as well as discharges from individual homes and industries. A regional secondary treatment plant serving these three communities will be under construction shortly.

Fresh water resources in the basin are limited. As described earlier, the area consists of small streams draining into coastal waters. Fresh water streams include the Saugus, Pines, Forest, North, Waters, Crane, Porter and Bass Rivers. Water quality standards have not been applied to these rivers, as their quality conditions have not been assessed through any sampling programs. All of these streams have been designated as anti-degradation streams by the Division. This means they are not to receive any new discharges.

The Saugus River drains a 38 square mile area which includes portions of Saugus, Lynn, Lynnfield, Malden, Melrose, Peabody, Reading, Stoneham and Wakefield. The Pines River drains portions of Melrose, Malden, Everett, Revere and Saugus. The Saugus and Pines Rivers reach a tidal confluence just prior to their discharge to Lynn Harbor. The Forest River drains portions of Lynn, Swampscott and Salem before discharging into Salem Harbor. The North, Waters, Crane, Porter and Bass Rivers drain portions of Salem, Peabody, Danvers and Beverly; all discharge to the Danvers River which subsequently flows into Beverly Harbor.

Lynn, Salem and Beverly Harbors are presently in the SC water quality class. Manchester Harbor is classed as SB quality. All of these areas have been designated as effluent limited by the Division. In other words, the water quality throughout these coastal waters should be upgraded to meet the goal of SB water quality through the application of available technology. This means that the water quality goal of SB water can be met through the elimination of untreated discharges of raw sewage and the construction of new and upgraded wastewater treatment plants mentioned earlier.

One of the most serious impacts of the present water quality of SC is that felt by the shellfish industry. Of the total productive shellfish area (3,056 acres), 70 percent is closed due to bacterial contamination. Eleven percent is restricted, meaning that these areas can only be harvested by licensed master diggers who must send their shellfish to the depuration plant in Newburyport before selling their clams. Nineteen percent of the area is open. (Statistics cited are from the DWPC and include the Cape Ann area.)

Other negative impacts caused by the existing conditions include limiting the recreational use of the coastal beaches for swimming, as well as aesthetic problems due to odors, visible scum, and floating matter leading to nuisance conditions in many areas.

C. ON-GOING PLANNING AND IMPLEMENTATION ACTIVITIES

At present, the Ipswich River Watershed District Commission's Water Allocation Study (See Ipswich Basin Overview) is the only basinwide on-going planning activity. Several North Coastal streams communities also depend on the Ipswich River for their water supply. Notable among these is the Salem-Beverly Water Supply Board who also have several projects underway in both basins.

Gloucester, Rockport, Ipswich and Essex are four of a number of Massachusetts communities not previously designated for study in the original 208 programs. The state DEQE must complete 208 plans for all non-designated areas by June 1979. MAPC, under contract with DEQE, is currently developing a Cape Ann 208 program to study these four communities. Cape Ann waste treatment management plans will determine the use of future federal funds for water pollution control. As with the other 208 plans, this means that no permits or grants for water pollution projects or methods can be authorized that are in conflict with the adopted plans and that state and federal water pollution control strategies and priorities must be based on these plans. A Policy Advisory Committee consisting of more than half local officials is being formed to review 208 recommendations during the course of the study. In June 1976 local officials of Gloucester, Rockport, Essex and Ipswich identified the following water quality problems they felt should be included in the Cape Ann 208 program:

- untreated discharges (residential, municipal combined sewer)
- stormwater runoff
- erosion, sedimentation
- failing septic systems
- industrial pretreatment (fish processing)
- vessel discharges
- landfills
- salt water intrusion
- impact of upstream water quality
- inadequate treatment from existing plants

D. MAJOR BASIN ISSUES

The major issue currently being faced by ten of the twelve communities in the basin is the EPA requirement to provide secondary treatment at all wastewater treatment facilities discharging to the Marine environment. Lynn, Nahant and Saugus and the South Essex Sewerage District which includes the towns of Salem, Beverly, Peabody, Danvers and Marblehead are two regional facilities which must meet this requirement. Manchester and Swampscott each have individual treatment facilities. As it has not yet been shown that provision of secondary treatment will result in measurably improved water quality as opposed to primary treatment, the cost-effectiveness of such large expenditures cannot be shown. Each of the facilities should seek a waiver of the secondary treatment requirement until or unless it can be demonstrated by EPA that the provision of such treatment will result in improved water quality under the provisions of Public Law 95-217 which amends Public Law 92-500.

BEVERLY: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

The city of Beverly is served by the South Essex Sewerage District (SESD) and only nine percent of its population utilizes on-lot sewage disposal systems. There are no areas experiencing problems related to on-lot disposal systems in the city. No expansion of sewer systems is therefore needed at present beyond what is already planned to be sewered. Any future extensions of sewer service should be carefully studied in terms of need as well as desirability.

II. STORMWATER MANAGEMENT

Seven major storm drainage systems were identified in CDM's inventory of stormwater collection systems. Of these systems, three discharge to the Bass River, two to the ocean, one to North Beverly Brook, and one to a wetland tributary to Longham Reservoir. However, records are incomplete, and it is reasonable to assume that most, if not all, of the developed areas in the town are served by a storm drainage system.

The Department of Public Works is responsible for the operation and maintenance of the stormwater collection system. Catch basin cleaning and other maintenance is generally done on an "as needed" basis. Recommendations to the city include the following:

- The DPW should initiate a program of locating and inspecting storm drain outfalls, catch basins in problem areas, and receiving streams to evaluate existing conditions.
- Based on the above inventory and evaluation, a program of regular catch-basin cleaning and stream maintenance should be developed and implemented by the DPW.
- The development of neighborhood street cleaning and litter programs should be investigated in the city.
- In site planning for future land development, maximum use should be made of the existing storm drain collection system, natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

Average annual local costs are as follows:

- | | | |
|----------------|-----------|--|
| (1) Sewerage | 0 | |
| (2) Septage | 0 | (continue disposal into SESD) |
| (3) Stormwater | \$182,200 | (much of this cost already may be included in local budgets) |

See Part II of the draft Areawide Plan for an explanation of cost estimation methodologies.

IV. INDUSTRIAL WASTEWATER

Five industries in Beverly have been identified as significant dischargers. USM Corp., Varian Associates and Ventron Corp. have been issued NPDES permits. Comdell, Inc. and Gurnard Manufacturing Co. have been classified as significant because they have the potential to discharge a toxic effluent.

Recommendations to the city include the following:

- 1) The city should update its existing sewer use law using the MAPC Model Sewer Use Law as a guide. In any case, the city's sewer use law should be as stringent or more stringent than the SESD sewer use law. In addition, a drain layer's manual should be adopted to regulate sewer connection installation.
- 2) New industries should be required to discharge sanitary and process wastewaters (with pretreatment, if required) to the sewer system. Water conservation and recycling of process wastewaters should be encouraged.

V. NON-POINT SOURCES

A. Landfills. The city of Beverly operates a landfill off Brimbal Avenue adjacent to Route 128. The facility which occupies an area of 40 acres is located in a dry, forested upland area and has a leachate collection system. The landfill drainage is pumped from the collection system into an SESD sewer. Because of the arrangement, leachate impacts have been successfully controlled. The Beverly landfill is not located above an aquifer, and is therefore unlikely that any large volume of leachate leaves the site via the subsurface.

Engineering plans have been developed for the final phase of operation and for the closing procedures. A remaining period of operation of 8 years is specified in the plans.

B. Salt Storage and Application. No adverse impacts have been recorded on groundwater or surface water quality due to improper storage of road de-icing salt. Reservoirs of the Salem and Beverly, Manchester and Danvers systems have maintained their good to excellent quality.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.

- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI . PREVENTIVE LAND USE CONTROLS

Beverly does not have any wetlands or floodplain zoning at the present time. The city should institute procedures to map its wetlands and floodplains accurately and in sufficient detail to enable it to adopt some form of wetlands/floodplain zoning in the near future. As part of or in addition to a wetlands/floodplain district, Beverly should delineate and enact a special buffer district along the Bass River and possibly along the western shore of Wenham Lake, which is the only portion of the lake not controlled by the Salem and Beverly Water Board.

In the future, Beverly should consider further protection of aquifer recharge areas and watersheds of water supply reservoirs.

Some areas in Beverly are currently zoned for uses incompatible with the environmental capability of the land to support those uses. If sewers are not constructed, zoning changes with respect to the use or density allowed should be considered.

VII . MANAGEMENT

Since wastewater treatment recommendations for Beverly do not go beyond what is currently planned, wastewater management recommendations are minimal. The city should adopt a sewer user charge to replace its current method of deriving funds for operation and maintenance through general tax revenues. Such a system should meet EPA user charge requirements (see Part II , Section 1 of this plan). Beverly should also revise and update its current sewer use ordinance (which was adopted on May 20, 1974). A new ordinance should consider the model sewer use ordinance and drain layer's manual presented in this plan, and should be compatible with and complimentary to SESD's sewer use regulations. Reference should also be made to model sewer use laws developed by the Mass. Division of Water Pollution Control (1974) and the Water Pollution Control Federation (1975). The city's wastewater facilities are administered by the Department of Public Works. This management arrangement should continue. It should be noted that because extensive improvements to the SESD system are presently being carried out with federal and state construction grant funds, the district and its member municipalities must adopt sewer use regulations, develop and implement industrial cost recovery and user charge systems, and identify those industries which may require pretreatment to meet EPA regulations and/or guidelines. The district does not have the authority to make industrial cost recovery assessments or assess user charges to individual users. However, in an effort to meet federal requirements that user charge and industrial cost recovery systems will be implemented, member communities, including Beverly have assured EPA in writing that such systems will be implemented. Beverly must substantially alter its present method of meeting sewerage costs in order to comply with federal user charge and industrial cost recovery provisions.

While management action is not called for with respect to Beverly's current landfill, the city should move ahead in planning for future solid waste disposal.

The South Essex Solid Waste Disposal District, and the Tri-City resource recovery project are two future solid waste management alternatives that should be carefully considered.

The Beverly Planning Board, working closely with the Conservation Commission should carefully consider the preventive land use controls proposed above. Funds should be sought from the city council to accurately map wetlands and floodplains. If compatible with community plans and goals these land use recommendations should be proposed in ordinances and presented to the city council for action.

BEVERLY: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
- II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
- III. Social Impacts
 - A. Open Space and Recreation
 - B. Archaeological and Historic
 - C. Housing
- IV. Economic Impacts
 - A. Manufacturing

I. DIRECT COST IMPACTS

With the exception of stormwater costs, there would be no direct cost impacts associated with the recommendations for Beverly.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining possible effects on erosion of the water quality recommendations for Beverly there appear to be moderately positive impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

In those areas where the density of permitted residential development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area, potential erosion problem would be reduced and this would be a positive effect of long-term consequence.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that moderately positive impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The adoption of wetland/floodplain district would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

C. Groundwater Impacts. The land use control mechanisms recommended for Beverly appear to have positive impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Positive effects on groundwater could accrue in areas where groundwater favorability coincides with recommended environmental zoning districts, such as floodplain and wetland overlay districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater could continue for as long as the environmental districts are in force. Another potentially positive impact would result from the implementation of other recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations do constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low to moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitat. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The use of floodplain/wetland districts in Beverly would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

E. Air Quality Impact. It is anticipated with the growth patterns projected in the recommendations, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the recommendations will have a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Beverly would be slightly positive with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents.

In Beverly, several scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these floodplains, wetlands, or stream buffer districts

would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

In several places in Beverly where open space could be affected by development the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological & Historic Impacts. The impacts on the Fish Flake Hill Historic District, although adjacent to a small high density residential area, would be negligible.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 1450 housing units anticipated for means that about 1375 acres of residential land will be developed over the 20-year period.

Beverly allows for a variety of housing types and therefore impacts on housing would be minimal.

IV. ECONOMIC IMPACTS

A Manufacturing. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is necessary to determine the potential impacts upon such manufacturing establishments. Because cost impact ultimately will affect jobs, it is important to estimate how manufacturing may be most affected by the requirement of the water quality plan.

Presently, Beverly has nine "wet" manufacturing firms that account for about 11 percent of all that city's manufacturing employment. Seven of these firms have been identified as having fewer employees than the median for their counterparts statewide. Thus, these firms may have difficulty maintaining a competitive posture while adhering to water quality standards. Water-intensive employment in Beverly accounts for only three percent of total employment now, and by 1995, is expected to grow to 1146 jobs, or seven percent of total employment. Thus, it appears that if the firms discussed above do not survive, healthier ones could take their places, and grow considerably.

DANVERS: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

The town has a sewerage system that serves about 88 percent of the population. All wastewater is discharged to the SESD Danvers-Beverly interceptor. There are seven pumping station bypass/overflow discharges from the Danver's system that have been identified in the NPDES permit.

It is recommended that the town:

- Initiate a 201 facilities plan for upgrading the town's sewer system in order to eliminate existing bypasses and overflows.
- Continue to extend sewer system as and when such a need is recognized by the town.
- Continue with the maintenance and inspection program of on-lot disposal systems.

II. STORMWATER MANAGEMENT

Eight small stormwater collection systems were identified by CDM in its inventory. All of these are relatively new subdivisions. Plans for the older storm drain systems have not been maintained.

Catch basin cleaning is performed on an annual basis by the Highway Department. Other problems, such as root intrusion, are handled by a preventive maintenance program.

Recommendations to the town are:

- The Highway Department should initiate a program of inventorying catch basins and storm drain outfalls to determine the magnitude, extent and locations of outfalls of the older storm drainage systems in town, particularly those serving the more heavily urbanized areas.
- The city should evaluate the feasibility and need for neighborhood street cleaning and litter programs.
- Outfalls should be inspected periodically to determine the need for (a) outfall structures such as gratings or weirs, and (b) channel maintenance.
- In site planning for future land development, maximum use should be made of existing drainage systems, natural drainage, and non-structural runoff control measures in areas applicable.

III. ESTIMATED COSTS

Average Annual Local Costs are as follows:

(1) Sewerage	0	
(2) Septage Treatment	0	(Continue with SESD)
(3) Stormwater	\$175,400	(Much of this costs may already be in local budgets.)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Six industries in Danvers have been identified as significant dischargers. North Shore Cutting Die, Inc. and the two Creese and Cook, Inc. plants were classified as significant dischargers because they may have toxic wastes in their discharges. GTE Sylvania, Inc. has two plants in Danvers that have been issued NPDES permits for cooling water discharges to the Waters River and a tributary of Mill Pond. White Fuel Company has applied for an NPDES discharge permit for stormwater runoff containing oil and grease.

Recommendations to the town include the following:

- The city should update its existing sewer use law using the MAPC-Model Sewer Use Law as a guide. In any case, the town's sewer use law should be as stringent or more stringent than the SESD sewer use law. In addition, a drain layer's manual should be adopted to regulate the installation of sewer connections.
- New industries should be required to discharge sanitary and process wastewaters (with pretreatment, if required) to the sewer system. Water conservation and recycling of process wastewater should be encouraged.

V. NON-POINT SOURCES

A. Landfills. The town of Danvers disposes of its solid waste in a public landfill on East Coast Road near the intersection of Routes 1 and 128. In spite of efforts to maintain good drainage, cover, and grading conditions, this facility suffers from a severe leachate problem which has contaminated ponds and wetlands to the north and east of the site.

It is recommended that the town should update the engineering plans for upgrading and operating the facility. These plans should include an assessment of the leachate impact on surface and groundwaters. Remedial measures based upon this assessment should be designed and implemented to mitigate the long term impact.

B. Salt Storage and Application. No evidence of salt contamination of surface or groundwater has been recorded. Reservoirs of Danvers have maintained their good to excellent quality.

The following program to prevent road salt contamination is recommended to all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streamtributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

In some areas in Danvers, current zoning is in conflict with the environmental capability of the land to support that type of development. Where on-lot disposal continues to be used, rezoning should be considered.

In the future, Danvers should also consider an aquifer recharge district and a stream/pond buffer district as further protection of its water resources.

VII. MANAGEMENT

Danvers should request that town meeting approve the initiation of a 201 facilities plan in order to eliminate existing bypasses and overflows. The town's wastewater facilities, tributary to the SESD, are administered by the Department of Public Works.

It should be noted that because extensive improvements to the SESD system are presently being carried out with federal and state construction grant funds, the district and its member municipalities must adopt sewer use regulations, develop and implement industrial cost recovery and user charge systems, and identify those industries which may require pretreatment to meet EPA regulations and/or guidelines. The District does not have the legal authority to make industrial cost recovery assessments or assess user charges to individual users. However, in an effort to meet federal requirements that user charge and industrial cost recovery systems will be implemented, member communities, including Danvers, have assured EPA, in writing, that such systems will be implemented.

Danvers currently has a user charge system which bills at a rate of 20¢/100 cu. ft. of water use for all users of the system. Since a portion of the flow from Danvers is from industrial users (and 72 percent of this flow is process wastes) this system does not adequately consider strength characteristics, and will likely need some revision to meet EPA requirements. In addition, Danvers sewer use ordinance, revised in April of 1975, should be reviewed in light of EPA requirements and the model sewer use ordinance and drain layer's manual presented in this plan.

The Board of Health should carry out vigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems

and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems, to requiring septic system which fail or become nuisances to connect to public sewers, where such sewers are accessible.

The Danvers Board of Health and the conservation commission should carefully monitor the town's landfill to determine the extent of the water quality impact of this facility on nearby ponds and wetlands. A town meeting warrant article should be prepared to authorize the updating of the engineering plans for upgrading and operating this facility.

The Planning Board, in conjunction with the conservation commission, should consider the zoning change recommendations presented above and, consistent with community policies and goals, present such changes for town meeting approval.

DANVERS: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space & Recreation
- B. Archaeological & Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

There are no direct cost impacts resulting from the recommendations for stormwater treatment. Costs for stormwater management already may be largely included in local budgets. Costs for the 201 study are 100% reimbursable with federal funds and that study will determine, with public reviews, the cost of correcting the overflows and bypasses.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the projected growth for Danvers there appear to be slightly negative impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

The amount of potential erosion areas affected by the projected growth appears to be approximately 200 acres.

Positive effects would result in those areas where the intensity of permitted development would be reduced, by reducing zoning to not conflict with the environmental capability of the land. Potential erosion problems would be reduced in these areas, and this would be a positive effect and would be a long-term consequence.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of future growth projections in terms of potential flood control problems, it appears that some negative impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extent of the flood control problem areas appears to be less than 300 acres in Danvers. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The projected growth and solutions recommended for Danvers appear to have some positive and negative impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

However, some positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as floodplain and wetland overlay districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force. However, some areas of groundwater favorability are not currently included in these districts and therefore remain available for development.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls and an aquifer protection district might mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the future growth do constitute a significant amount of the total land available for development in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community.

One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitat.

The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The amount of potential wildlife habitat in Danvers appears to be over 1300 acres.

E. Air Quality Impacts. It is anticipated that the future growth will have a negligible impact on air quality.

III. SOCIAL IMPACT

A. Open Space & Recreation Impacts. Generally, impacts on public and semi-public lands in Danvers would be slight with development according to the projected growth.

B. Archaeological & Historic Impacts. A review of the potential impacts of the projected growth on existing archaeological and historic sites in Danvers indicates that the growth pressure would create negligible impacts on sites.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and these should be addressed in the Environmental Impact Statement which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the projected growth in terms of the amount of land available in the community. The projected 800 housing units anticipated for Danvers means that over 500 acres of residential land will be developed over the 20-year period. Danvers appears to be capable of accommodating the expected residential demand.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACT

A. Manufacturing. The process of cleaning up area waterways and water-bodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is necessary to determine the potential impact of these costs upon such manufacturing establishments. Because cost impacts ultimately will affect jobs, it is important to estimate what firms may be most affected by the requirement of the water quality plan.

It can be seen that Danvers would have both potentially positive and negative impacts on manufacturing. The expansion and use of sewer service areas as outlined in Danvers would allow opportunities for increased levels of manufacturing activities, and thereby increase employment levels. The principle reason for such an effect is that with the introduction of sewer service to industrial land, these areas could assimilate more structural development, which could then accept more labor-intensive economic activities. An example might be the difference between a warehouse employing only a half-dozen people and an electrical machinery plant employing a few hundred. Indeed, the presence of sewerage might encourage some towns to rezone areas for industrial use given the proper market, and other economic conditions.

Counterbalancing this increased opportunity for accommodating manufacturing activities is the requirement that industries pay a proportional share of the capital costs of sewage treatment, based on their share of the waste load. This potential cost to industries could inhibit plant expansion, or initial location, thereby precluding the full measure of employment opportunities.

The recommendations for Danvers represent little or no reliance on structural solutions to water quality problems and as a result it would seem that opportunities for employment in manufacturing would be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses.

Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

Danvers has 22 jobs in water-intensive manufacturing firms. Water intensive employment is expected to grow to almost one-quarter of manufacturing employment by 1995. As a percentage of total employment, this would account for 5 percent.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

LYNN: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

A system of separate and combined sewers presently serves nearly 100 percent of Lynn's population.

The city has a facilities plan that proposes the construction of a regional wastewater treatment plant to serve Lynn, Saugus and Nahant. The final design (Step II) is now underway. No additional recommendations are considered necessary. The construction of the proposed regional sewage treatment facility would alleviate pollution problems caused by the discharge of raw sewage into Lynn Harbor.

II. STORMWATER MANAGEMENT

Lynn is served by a comprehensive stormwater collection system. CDM identified twelve discharges in its storm drain inventory. Nine of these discharge to the Saugus River or its tributaries. The remaining three discharge to Lynn Harbor. Significant portions of this system are combined sewers. Combined sewers are expected to be eliminated as the city proceeds with the construction of the Lynn-Saugus-Nahant Regional Wastewater Treatment Facility.

The Department of Public Works is responsible for annual catch basin cleaning and preventive maintenance programs in the stormwater collection system. Recommendations to the city include the following:

- The DPW should begin a program of regular storm and combined sewer outfall inspection to determine the need for outfall control structures, such as grates, and the need for receiving channel maintenance.
- The city should investigate the feasibility and need for neighborhood street cleaning and litter programs.
- In site planning for future land development or redevelopment, the existing storm drainage infrastructure should be utilized to its optimum capacity.

III. ESTIMATED COSTS

Average Annual Local Costs are as follows:

(1) Sewerage	0	
(2) Septage	0	
(3) Stormwater	\$181,600	(much of this cost already may be included in local budgets)

See Part II of this draft Areawide Plan for an explanation of cost estimation methodologies.

IV. INDUSTRIAL WASTEWATER

Seven industries in Lynn have been identified as significant dischargers. The John Boyde Company, Nissen Baking Corporation and West Lynn Creamery, Inc. were classified as significant because they have discharges to the sewer system of greater than 50,000 gpd. Everett Plating and Metal Finishing and C.W. Chrome were classified as significant because they may discharge toxic wastes to the sewer system. The General Electric (Air Force plant) has been issued an NPDES permit for cooling water discharges to the Saugus River. Exxon Corporation has a discharge to the city's storm sewers and has applied for an NPDES permit.

Recommendations to the city include the following:

- The city should adopt a sewer use law comparable to the model sewer use law developed by the MAPC. The adoption of a drain layer's manual is recommended to regulate the installation of sewer connections.
- New industries should be required to discharge sanitary and process wastewater (with pretreatment, if required) to the sewer system. Water conservation and recycling of process wastewater should be encouraged.

V. NON-POINT SOURCES

A. Landfills. The city of Lynn operates a landfill off Commercial Street on coastal land which was filled with dredged sand behind the Lynn Harbor sea wall. The facility covers roughly 30 acres and is set back nearly 150 feet from the sea wall.

The landfill site is approaching its capacity and will be closed in the next year or two. The city has recently appropriated funds to develop plans for the final period of operation and for site closing and sealing. Recommendations to the city are:

- The site investigation leading to the closing plans should investigate leachate generation and movement. Corrective measures to control any problems discovered should be incorporated into the plans for closing.

B. Salt Storage and Application. No pollution problems related to improper salt storage in the city have been recorded.

The following program for preventing road salt contamination is recommended for local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Immediate changes in land development controls to address water quality would not be necessary in Lynn since the city is predominantly developed and served almost totally by sewers.

VII. MANAGEMENT

Lynn is currently negotiating the settlement of a suit filed in June, 1977, by the U.S. Attorney, following the city's non-compliance with the terms of its NPDES permits. Points to be resolved include the schedule for the design and construction of the city's proposed treatment facility and movement toward adoption of an adequate sewer use law.

Lynn's proposed facility will be a regional facility serving Lynn, Saugus and Nahant. Intermunicipal service agreements are currently being prepared for this facility. These agreements should be drafted to insure consistency with the requirements of Section 208(c)(2) of the FWPCA. They should obligate each community to enforce the federal requirements for user charges, industrial cost recovery, sewer system rehabilitation and sewer use ordinances. They should set average daily flow rates with provisions for peak flows and financial arrangements which allocate capital costs and annual operation and maintenance costs (in proportion to flow rates and strength as they relate to treatment costs). An administrative overhead charge provision may also be appropriate. Lynn must adopt a sewer use charge in the future, along with industrial cost recovery measures (see Part II, Section 1 of this plan for a description of the federal requirements).

Lynn's municipal wastewater facilities are currently administered by the Lynn Department of Public Works, Sewer Division. The city should consider the establishment of a sewer commission to deal with the complex administrative issues facing the city in terms of wastewater management.

The Lynn Board of Health should carefully monitor the final period of operation and the closing of the city landfill, to insure that state regulations are being met, and that public health problems are identified and corrected.

LYNN: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
- II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
- III. Social Impacts
 - A. Open Space and Recreation
 - B. Archaeological and Historic
 - C. Housing
- IV. Economic Impacts
 - A. Manufacturing

I. DIRECT COST IMPACTS

No direct costs are anticipated with the exception of those associated with stormwater management.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of future growth for Lynn there appear to be relatively significant impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

The amount of potential erosion areas affected in Lynn appears to be approximately 200 acres.

B. Flood Control Impacts. When assessing the potential effects of the anticipated future development in terms of potential flood control problems, it appears that significant impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extent of the flood control problem areas appears to be 225 acres in Lynn.

C. Groundwater Impacts. The growth anticipated, as a continuation of existing trends, for Lynn appear to have moderate impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability. Most of the land available for development is zoned for medium residential density which is not as adverse to groundwater as more dense or more intensive land uses.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future development in Lynn constitutes a small amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as moderate to high density type of development which has been occurring up to now means that urban development is dispersed across the community.

One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time and reduces their capacity to provide habitats.

The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

E. Air Quality Impact. It is anticipated with the growth patterns projected for Lynn as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. Therefore, impacts on air quality would be negligible.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Impacts on open-space for Lynn would be minimal with future growth as anticipated. The Lynn Woods has been preserved as a significant open space for passive recreation. Potential impacts from projected high density residential and industrial development along the periphery of this area would be indirect and minimal.

B. Archaeological and Historic Impacts. There are no known archaeological or historic sites in Lynn.

C. Housing Impacts. Impacts on housing in Lynn would be negligible since Lynn allows a significant amount of multi-family housing for low and moderate income families.

IV. ECONOMIC IMPACTS

A. Manufacturing. Lynn is the home of over 30 water-intensive manufacturing firms employing large numbers of people. Although the majority of these firms should be able to maintain viability while complying with water quality standards, the absolute numbers of jobs potentially affected in a negative way is large enough to create a significant negative impact on water-intensive manufacturing employment in Lynn. The 1995 projections bear this out, showing a marked decline

in this type of employment in relation to total employment in that city. In 1975, there were about 9100 jobs in water-intensive industries. By 1995, this is expected to decrease to about 7200 jobs and account for about 15% of total employment in the city.

LYNNFIELD: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

The town of Lynnfield is entirely served by on-lot sewage disposal systems. Several areas in the town have been documented by the health agent as experiencing chronic septic system problems. Such areas include Crescent Avenue, Summer Street near Pillings Pond and Tophet Road areas. Recommendations to the town include the following:

- Initiate a 201 facilities planning study to assess the need and desirability for structural and non-structural solutions. Sewering only existing problem areas and a tie-in into SESD or Lynn treatment facilities seems to be a feasible alternative.
- The town should enforce a rigorous inspection and maintenance program for on-lot sewage disposal systems. Maintenance should include rehabilitation and/or reconstruction wherever necessary.
- All septic tanks should be pumped regularly at least once in two or three years.
- The 201 facilities plans should also develop alternatives for septage treatment and disposal.

II. STORMWATER MANAGEMENT

Lynnfield is served by a comprehensive stormwater collection system, consisting mainly of a fairly large number of small systems. These systems typically discharge to the nearest stream, wetland or pond. A total of fourteen systems were identified by CDM.

At the present time, catch basin cleaning is done annually by the Department of Public Works. Recommendations to the town include the following:

- The DPW should initiate a program of catch basin inspection to determine the need for more frequent cleaning (say twice a year).
- The DPW should initiate a program of outfall and receiving stream inspection to determine the need for outfall and stream maintenance.
- In site planning for future land development, maximum use should be made of natural drainage and non-structural runoff control measures.

III. COST ESTIMATES

Average annual local costs are as follows:

(1) Sewage	\$118,000 (minimum sewer construction)
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(2)	Septage	\$19,300	
(3)	Stormwater	110,050	(much of this cost already may be included in local budgets)

See Part II of this draft Areawide Plan for an explanation of the cost estimation methodologies.

IV. INDUSTRIAL WASTEWATER

No significant industries have been identified in Lynnfield. Recommendations to the town include the following:

- 1) Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public water supplies.
- 2) Water conservation and recycling of process wastewaters should be encouraged.

V. NON-POINT SOURCES

A. Landfills. No pollution related to landfill leachate has been reported in the town.

B. Salt Storage and Application. No pollution problems have been documented with respect to improper salt storage in the town.

A program to prevent pollution from road salt use is recommended for local and state highway units. It includes:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions

VI. PREVENTIVE LAND USE CONTROLS

Lynnfield needs to extend its present floodplain district to include all major wetland areas in the community, or it should enact a separate wetlands zoning district. With the special wetlands mapping project being carried out in town presently, Lynnfield should be in a position to adopt such a bylaw within the next year or so.

Lynnfield does not have sewers and therefore needs increased minimum lot sizes and use changes in certain areas where sewers are not recommended because of soils limitations for septic systems.

In areas where current zoning conflicts with the environmental capability of the land to support those types of development, rezoning for less intensive uses should be considered.

VII. MANAGEMENT

A warrant should be presented to town meeting for the appropriation of funds necessary to conduct a 201 facilities planning study. If such a plan recommended sewerage for Lynnfield then a sewer commission would have to be formed to manage the facilities, or this function could be delegated to an existing town department, such as the DPW. If the town system tied into the SESD or the Lynn facility, then suitable arrangements with those institutions would have to be formulated (an agreement with Lynn or a special act of the legislature allowing connection to the SESD). Federal user charge, industry cost recovery and sewer use ordinance requirements would also have to be met.

The Board of Health should initiate a rigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems.

In conjunction with the 201 study, evaluation of the septage disposal problem should be a consideration of a mandatory inspection and maintenance program for the community. Such a program could take many different forms (see Part II, Section 5 of this plan), depending upon the goals and resources of the community.

The Lynnfield Planning Board, working with the Conservation Commission, should carefully consider the preventive land use controls proposed above. Using the wetlands mapping being developed by the conservation commission as a base, zoning proposals consistent with these recommendations should be presented to town meeting.

LYNNFIELD: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
- II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
- III. Social Impacts
 - A. Open Space and Recreation
 - B. Archaeological and Historic
 - C. Housing
- IV. Economic Impacts
 - A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6 percent and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

areas of groundwater favorability could mean that the water used in these areas would no longer be recharged to the ground; rather it would be carried out of the community, thereby greatly reducing groundwater recharge in these areas. Negative effects could result not only on the recharge capacity of these areas, but also present contamination problems through infiltration. This can be seen as long-term impact, since any effects created would continue to occur throughout the lifetime of that development. Due to the low probability of reversing this type of effect once it is established, this impact could constitute an irreversible commitment of groundwater resources. The results of a negative impact might not be limited to a single area or community, since many communities utilize groundwater supplies common to more than a single town.

However, some positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as floodplain and wetland overlay districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force. Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations constitute a moderate amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low to moderate density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The extension of floodplain districts in Lynnfield would provide a benefit for wildlife. The development constraints imposed by this land use regulation would provide local benefits for as long as the regulation was in effect.

The amount of potential wildlife habitat affected by these recommendations appears to be about 150 acres.

E. Air Quality Impact. It is anticipated with the growth patterns projected in the recommendations, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the

The average annual cost would be \$68,500 for Lynnfield (not including stormwater costs), and this would result in an annual impact on the local tax rate of \$0.31. The annual operation and maintenance cost would be \$68,500.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for Lynnfield, there appears to be both negative and positive impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

In those areas where the use of sewer service has been recommended as a solution for water quality, erosion problems could be aggravated for those potential erosion lands. A short-term negative impact of using sewers in an area considered as having erosion potential is that during the construction phase of work there would be considerable disruption of the landscape. This removal of natural vegetation, plus the increased traffic for the construction work, would mean an increase in the potential for erosion.

Different effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

The amount of potential erosion areas affected by the recommendations in Lynnfield appears to be approximately 75 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effects.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that slightly positive impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extension of the floodplain district would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

The extent of the flood control problem areas, less the areas where flood control problems would be reduced with the extension of the floodplain district, appears to be about 120 acres in Lynnfield. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for Lynnfield appear to have both negative and positive impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability. Sewers in

estimated growth. It can be said in summary that the recommendations will have a negligible impact on air quality.

One short-term effect which would be very localized in significance would be that the level of particulate matter in the atmosphere would be expected to rise temporarily during the construction phase of the sewerage expansion because of the truck transportation of materials and supplies to and from the construction sites.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Lynnfield would be slight with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents. In a few areas in the town, small open space parcels are adjacent to or surrounded by land zoned for industrial use. Impacts from this type of development on open space could be slightly negative, long-term, but primarily of local importance.

In Lynnfield, several scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these floodplains or wetlands districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

In several places in Lynnfield where open space could be affected by development, the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased, according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. One archaeological site in the southern section of the town is in both a developed area and in an area zoned for medium-high density residential use. However, the recommended extension of Lynnfield's floodplain district would cover this site and could protect it from being developed. As long as this regulation remained in effect, the impact would be positive and regional in significance.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites.

The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on other archaeological or historic sites and should be addressed in the Environmental Impact Statement which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth with the recommendations in terms of the amount of land available in the community. The projected 1095 housing units anticipated for Lynnfield means that 1050 acres of residential land will be developed over the 20-year period.

Lynnfield allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of costs.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the outlined environmental zoning districts, which would either prohibit or constrain housing development occur in parts of the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressures and the reduction of land available for development would serve to intensify this pressure.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle-income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing. Although Lynnfield has a fairly small employment base, nearly 74 percent of all manufacturing jobs are in water-intensive manufacturing firms. This proportion is expected to grow to nearly 84 percent by 1995, but remain a fairly small part of total employment. For a discussion of manufacturing employment impacts in Lynnfield, reference should be made to the Wastewater Engineering and Management Plan for Boston Harbor - Eastern Massachusetts Metropolitan Area (EMMA Study), Volume 13B, Socio-Economic Analysis, Chapter 5.0, for expected impacts upon industry in MDC-served municipalities, of which Lynnfield is one.

MANCHESTER: RECOMMENDED 203 PLAN

I. WASTEWATER TREATMENT

A sewerage system serves about 60 percent of the town's population. Wastewater is treated at a secondary treatment facility and discharged to outer Manchester Harbor. Several areas with septic system problems have been reported near the town center as well as in the eastern part of town. Recommendations for the town are as follows:

- The town should initiate a 201 facilities planning study to evaluate additional sewer service needs. The existing septic system problem areas should be considered for sewerage. This approach is slightly preferred by the town.
- Existing problem areas to the east of the town center, if sewerage, should be connected to the town's secondary treatment plant. Problem areas located in the extreme eastern part of town should be served by the proposed treatment plant in the Magnolia section of Gloucester.
- The town should adopt a strict inspection and maintenance program for on-lot sewage disposal systems to prevent future problems.

II. STORMWATER MANAGEMENT

The Department of Public Works is responsible for the operation and maintenance of the stormwater system. Catch basins were cleaned annually by the former Highway Department. The following recommendations are made to the town:

- The DPW should initiate a program of outfall and receiving stream inspection to determine the need for outfall and stream maintenance and cleaning.
- In site planning for future land development, maximum use should be made of natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

Average annual local costs are as follows:

(1) Sewerage	\$36,000	
(2) Septage	3,900	
(3) Stormwater	77,950	(much of this cost already may be included in local budgets)

See Part II of this draft Areawide Plan for an explanation of the cost estimation methodologies.

IV. INDUSTRIAL WASTEWATER

No significant industries have been identified in Manchester. Recommendations to the town include the following:

- 1) The town should adopt a sewer use law comparable to the model sewer use law developed by the MAPC. The town should also adopt a drain layer's manual to regulate the installation of sewer connections.
- 2) New industries should be required to discharge sanitary and process wastewater (with pretreatment, if required) to the sewer system.

V. NON-POINT SOURCES

A. Landfills. The town of Manchester operates a landfill off Pine Street approximately 500 feet to the south of the Hamilton landfill. The site has almost reached capacity and will have to be closed in the near future. Engineering plans for the remaining period of operation and for final closing are being prepared. Recommendations to the town include the following:

- The plans for closing the landfill site should include an analysis of the water quality impact on the wetlands and on Chebacco Lake, which may ultimately receive the drainage.

B. Salt Storage and Application. No pollution problems due to improper salt storage have been reported.

The following program to prevent contamination from road salt use is recommended for local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Land use development controls in Manchester are presently adequate to address water quality issues. However, the town should consider changes in zoning use and density in certain areas where there are conflicts with current zoning and the environmental capability of the land to support development.

VII. MANAGEMENT

Wastewater management recommendations for the town of Manchester include the adoption of a sewer use charge system and a sewer use ordinance which meets EPA requirements (see Part II, section I of this plan). The town is currently in the process of revising its existing rules and regulations and has had a user charge study done which recommended a sewer rate based on metered water consumption.

If a portion of the town connects to the proposed treatment plant in the Magnolia section of Gloucester, then an intermunicipal agreement would have to be executed with Gloucester. Such an agreement should be drafted to insure consistency with the requirements of section 208(c)(2) of the FWPCA. It should obligate each community to enforce the federal requirements for user charges, industrial cost recovery, sewer system rehabilitation and sewer use ordinances. It should set average daily flow rates with provisions for peak flows and financial arrangements which allocate capital costs and annual operation and maintenance costs (in proportion to flow rates and strength as they relate to treatment costs). An administrative overhead charge provision may also be appropriate.

The Board of Health should initiate a rigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems.

There should also be a consideration of a mandatory inspection and maintenance program for the community. Such a program could take many different forms depending upon the goals and resources of the community. As Manchester already has a town owned septic tank pumping truck, such a program could include a municipal inspection team with town ownership of septage pumping equipment. Manchester belongs to the Hamilton, Essex, Manchester Regional Health District so that there should be consideration of the adoption of such an inspection and maintenance program for the entire health district.

The Board of Health and the Conservation Commission should carefully monitor the remaining period of operation and the closing of the town landfill to insure compliance with state regulations and to identify adverse water quality impacts on nearby wetlands and Chebacco Lake. Such negative impacts should be reported to the state DEQE and DWPC.

To insure future acceptable solid waste disposal facilities the town should consider the alternative of a regional resource recovery plant as is currently under consideration by the South Essex Solid Waste Council.

The town planning board, in consultation with the conservation commission should investigate zoning use and density changes in areas where the current zoning conflicts with the environmental capability of the land to support development (see MAPC environmental pattern maps). If a detailed analysis affirms such a conflict, appropriate zoning changes should be presented to town meeting.

MANCHESTER: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one water quality solution over another, and the questions, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of Manchester. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6% and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual change in the

community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost would be \$17,500 for Manchester, (not including stormwater costs), and this would result in an annual impact on the local tax rate of \$0.29. The annual operation and maintenance cost would be \$22,400.

A. Erosion Impacts. In examining the possible effects on erosion for Manchester there appear to be slight impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

In those areas where the use of sewer service has been recommended as a solution for water quality, erosion problems could be aggravated for those potential erosion lands.

A short-term negative impact of using sewers in an area considered as having erosion potential is that during the construction phase of work there would be considerable disruption of the landscape. This removal of natural vegetation, plus the increased traffic for the construction work, would mean an increase in the potential for erosion.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effects.

B. Flood Control Impacts. When assessing the potential effects of future growth in terms of potential flood control problems, it appears that slight impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extent of the flood control problem areas appears to be about 70 acres in Manchester. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The anticipated future developemnt for Manchester appear to have moderately negative impacts on potential groundwater supplies as indicated by areas of high groundwater favorability.

The community has an environmental overlay district which protects at least some of these high yield areas, but the areas not so protected are available for development, which would adversely affect the recharge function of the aquifer.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The area of potential wildlife habitat which possibly could be affected by future development constitutes a significant

amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low to moderate-low density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitat. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact. There are currently about 1500 acres of potential wildlife habitat in Manchester.

E. Air Quality Impact. It is anticipated with the growth patterns projected in the recommendations, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the recommendations will have a negligible impact on air quality.

One short-term effect which would be very localized in significance would be that the level of particulate matter in the atmosphere would be expected to rise temporarily during the construction phase of the sewerage expansion because of the truck transportation of materials and supplies to and from the construction sites.

III SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Impacts on open space and recreation areas would be minimal with development as a continuation of existing growth trends. These parcels are located adjacent to or are surrounded by areas zoned for low to moderate residential density which is not incompatible with open spaces.

B. Archaeological and Historic Impacts. The Manchester Historic District is adjacent to a small area zoned for commercial use, but even if this parcel is developed, the impact on the Historic District would be minimal.

As the community undertakes 201 facilities planning specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 670 housing units anticipated for Manchester means that 965 acres of residential land will be developed over the 20-year period.

Manchester allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the

Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACT

A. Manufacturing. With the second smallest employment base in the North Coastal Basin, Manchester still has some water-intensive manufacturing activity. By 1995, this type of manufacturing is expected to employ over 200 persons and account for over half the town's manufacturing employment. However, as a percentage of total employment, water-intensive employment is estimated to be 23 percent.

Although the potential negative impact on manufacturing employment could be severe, the projected growth indicates a capability for such firms to remain competitive and grow while complying with water quality standards.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

MARBLEHEAD: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

A sewerage system serves nearly the entire population of the town. There are only 15 septic systems currently in use in Marblehead. These on-lot systems are performing satisfactorily and presently do not need to be connected into the sewer system.

All wastewater is presently being discharged to Massachusetts Bay without treatment. An interceptor is under construction that will transport Marblehead's wastewater to the regional SESD treatment facility in Salem. This connection to SESD will eliminate raw sewage discharge into the bay.

No recommendations beyond the on-going projects are considered necessary.

II. STORMWATER MANAGEMENT

The town is served by a comprehensive stormwater collection system.

The Selectmen's Maintenance Department is responsible for the operation and maintenance of the stormwater collection system. Catch basin cleaning is done by the Highway Department. No schedule was identified for the catch basin cleaning. Recommendations to the town include the following:

- A regular catch basin cleaning program should be initiated on at least an annual basis.
- Outfalls should be inspected periodically and cleaned if necessary.
- The town should evaluate the feasibility and need for the development and implementation of neighborhood street cleaning and litter programs.
- In site planning for future land development, maximum use should be made of the existing stormwater collection system.

III. ESTIMATED COSTS

Average annual local costs are as follows:

(1) Sewerage	0	
(2) Septage Treatment	0	
(3) Stormwater	\$96,800	(much of this cost already may be included in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

No significant industries have been identified in Marblehead. Recommendations to the town include the following:

- 1) The town should update its existing sewer use law using the MAPC model sewer use law as a guide. In any case, the town's sewer use law should be as stringent or more stringent than the SESD sewer use law. In addition, the town should adopt a drain layer's manual to regulate the installation of sewer connections.
- 2) New industries should be required to discharge sanitary and process wastewaters (with pretreatment, if required) to the sewer system. Water conservation and recycling of process wastewaters should be encouraged.

V. NON-POINT SOURCES

A. Landfills. The town of Marblehead operates a transfer station at the site of the old dump near Green Street and Beacon Street. Municipal refuse is presently hauled to the private SCA landfill in Amesbury from the town transfer station. Recommendations to the town include the following:

- The town should prepare final plans for the closure of the former ash dump. The ash dump should be sealed in the manner specified in the state regulations.

B. Salt Storage and Application. No pollution problems attributable to improper salt storage have been recorded.

The following program to prevent salt contamination is recommended to all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Substantial wetlands and associated flood hazard areas not already under public or quasi-public ownership should be zoned accordingly based on detailed

mapping studies. In addition, Marblehead should consider for the future an aquifer recharge district and a stream/pond buffer district to further protect its water resources.

VII. MANAGEMENT

As noted above, Marblehead is presently in the process of connecting its system to the SESD. Marblehead became a member of the SESD in 1972. Its municipal collection facilities are administered by the Sewer Department under the direction of the Board of Sewer Commissioners. It should be noted that because extensive improvements to the SESD system are presently being carried out with federal and state construction grant funds, the district and its member municipalities must adopt sewer use regulations, develop and implement industrial cost recovery and user charge systems, and identify those industries which may require pretreatment to meet EPA regulations and/or guidelines. The district does not have the legal authority to make industrial cost recovery assessments or assess user charges to individual users. However, in an effort to meet federal requirements that user charge and industrial cost recovery systems will be implemented, member communities, including Marblehead, have assured EPA in writing that such systems will be implemented. Marblehead is, of course, obligated to implement such systems anyway because of 201 funds received for the connection of its system to the SESD. In reviewing its sewer use ordinance reference should be made to the model sewer use ordinance and drain layer's manual presented in this plan.

The town Board of Health should carefully review final plans for the closure of the former ash dump to insure that state landfill regulations are complied with.

Town meeting should be requested to authorize detailed mapping studies to accurately identify wetland, flood hazard and aquifer recharge areas in the community. The town planning board and the conservation commission should then utilize this information to develop zoning changes for town meeting approval.

MARBLEHEAD: IMPACT ASSESSMENT

Categories

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space & Recreation
- B. Archaeological & Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

There would be no direct costs associated with the recommendations, with the exceptions of those associated with stormwater management (much of which may already be in the local budget.)

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the anticipated future development in Marblehead, there appear to be slight impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

The amount of potential erosion areas that could be affected appears to be approximately 35 acres.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that slightly positive impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The adoption of the environmental districts as recommended would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

C. Groundwater Impacts. Some positive effects on groundwater could accrue in areas where groundwater favorability coincides with recommended environmental zoning districts, such as wetlands and flood hazard districts. Because these environmental districts impose special constraints on development, they also function to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by continued growth constitute a significant amount of the habitat areas which are currently available in the community. However, the overall impact would be minimal since the amount of potential wildlife habitat in Marblehead is relatively small - less than 50 acres and the area is already developed to some extent.

E. Air Quality Impacts. It is anticipated with the growth patterns projected, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. Therefore impacts on air quality would be minimal.

III. SOCIAL IMPACTS

A. Open Space & Recreation Impacts. Impacts on open space and recreation would be minimal with future development. However, the adoption of wetlands and flood hazard zoning as recommended would impose development constraints in areas where they are in effect. These districts would then enhance open space and recreational opportunities if development is prohibited or minimized. This benefit would continue as long as the regulation remained in effect and it would be local in nature.

B. Archaeological & Historic. On the Salem Harbor side of Marblehead, there is an archaeological site in an area zoned for medium-high density residential use. If this site is developed, the impact would be negative. The loss of any archaeological site would be of regional significance.

On the edge of Old Town House Historic District, there are small areas zoned for medium-high and high density residential usage, but as long as the district is kept intact, the impacts would be minimal.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

C. Housing Impacts. Because a relatively small amount of growth is anticipated for Marblehead, in addition to the fact that Marblehead is zoned for medium and high density residential development, impacts on housing would be minimal.

IV. ECONOMIC IMPACTS

A. Manufacturing. Projections indicate that Marblehead will lose almost 50 water-intensive manufacturing jobs between now and 1995. Because this employment category accounts for only five percent of total town employment, it appears that overall impact would not be that significant.

NAHANT: RECOMMENDED 2008 PLAN

I. WASTEWATER TREATMENT

A sewerage system serves about 84 percent of the town's population. All wastewater is discharged from outfalls to local waters.

The town has completed a 201 facilities plan which outlines the improvements to the collection system. The improvements also include a tie-in into the Lynn regional wastewater treatment facility. Recommendations to the town include:

- 1) The town should expedite the completion of Step II and III of sewer improvement plan.
- 2) The town should extend sewers as planned to areas where septic system problems have been identified. One such area is located on Wilson Road in Little Nahant.

II. STORMWATER MANAGEMENT

Three stormwater systems were identified through previous visual inspection, as no plans or records have been maintained by the town. The major problem with Nahant's system is that many homes have tied into the stormwater drainage system for sewage disposal purposes, resulting in fairly regular discharges of raw sewage. This problem is expected to be resolved as the town implements the recommendations of its facilities plan for the construction of sanitary sewers, which will route the town's wastewater to the Lynn-Nahant-Saugus Regional Wastewater Treatment Facility. Stormwater systems draining areas of 11, 5 and 8 acres respectively currently discharge to Nahant Harbor.

The Highway Department is responsible for the operation and maintenance of the stormwater system. Catch basin cleaning is done on an annual basis. Recommendations to the town include:

- As the town's wastewater collection system is constructed, care must be taken to ensure that all existing individual connections to storm drains are eliminated.
- The Highway Department should begin a program of catch basin and outfall inspection to determine: a) the nature and extent of the stormwater system, and b) the need for maintenance of structures and appurtenances.

III. ESTIMATED COSTS

Average annual local costs are as follows:

(1) Sewerage	0	
(2) Septage Treatment	0	
(3) Stormwater	\$19,100	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

No significant industries have been identified in Nahant.

Recommendations to the town include the following:

- 1) The town should adopt a sewer use law comparable to the model sewer use law developed by the MAPC. The adoption of a drain layer's manual is also recommended to regulate the installation of sewer connections.

V. NON-POINT SOURCES

A. Landfills and Salt Storage and Application. No water quality problems emanating from improper salt storage and application or landfill leachate flow have been identified in the town. Hence no recommendations are necessary.

VI. PREVENTIVE LAND USE CONTROLS

Land development controls in Nahant are presently adequate to address water quality issues, although additional protection of water resources could be considered in the future.

VII. MANAGEMENT

As noted above, the town is in the process of upgrading its collection system and will tie into the proposed Lynn regional wastewater treatment facility. The town's collection system is administered by the Department of Public Works. Consistent with this 201 work the town will adopt a sewer use ordinance and a user charge system which meet federal requirements. In formulating a sewer use ordinance reference should be made to the model sewer use ordinance and drain layer's manual presented in this plan.

Intermunicipal service agreements are currently being prepared for the use of the regional facility in Lynn, serving Lynn, Saugus and Nahant. These agreements should be drafted to insure consistency with the requirements of section 208 (c) (2) of the FWPCA. They should obligate each community to enforce the federal requirements for user charges, industrial cost recovery, sewer system rehabilitation and sewer use ordinances. They should set average daily flow rates with provisions for peak flows and financial arrangements which allocate capital costs and annual operation and maintenance costs (in proportion to flow rates and strength as they relate to treatment costs). An administrative overhead charge provision may also be appropriate.

NAHANT: IMPACT ASSESSMENT

Recommendations for wastewater treatment would not involve any costs or additional construction other than what is already being done. Furthermore, only a small amount of new development is anticipated for Nahant. Therefore, the environmental, social and economic impacts for Nahant would be negligible.

While 208 recommendations may not have a significant impact on this community, the existence of a developed infrastructure, including sewers, places the community in a favorable position to attract beneficial new development and to encourage the restoration of older neighborhoods. Municipalities with sewers, storm drains, roads, public transportation and utilities already in place, can provide an environmentally and economically favorable alternative to the recent pattern of sprawl development.

One problem does exist, however, for communities with this infrastructure. Resources for renovation of facilities are critical to maintenance and restoration of the environment so that the quality of life in urbanized areas can be kept at desirable levels. Environmental restoration is equal in importance to environmental protection.

The advantages of revitalization of our developed urban and suburban areas will become increasingly evident as the cost of energy plays a larger role in development decisions. Private funds are being invested in existing developed areas at an increasing rate by businesses and private individuals and the results are becoming evident in profitable enterprises and comfortable restored homes. Public policies are also focusing on urban revitalization as evidenced by the Carter administration urban policy, the Massachusetts Growth Policy and the MAPC's "Policies for Land Use In Metropolitan Boston". Public investment must follow if we are to save two valuable environmental resources - the natural environment to be protected from wasteful sprawl development, and the urban environment to be protected from neglect.

PEABODY: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

A sewer system serves about 77 percent of the city's population. All wastewater is discharged to the SESD Peabody-Salem interceptor or the SESD Peabody-Salem relief interceptor.

A number of septic system problem areas have been identified in the city. These areas include Devil's Dishfull Pond, Parley Road, an area northwest of Waldens Hill and an area of trailer parks along Route 1.

Recommendations to the city include:

- The city should, as already planned, extend sewers to all identified problem areas.
- The city should enforce strict inspection and maintenance program for the non-lot disposal systems in areas that are not sewerred.

II. STORMWATER MANAGEMENT

Twelve stormwater collection systems were identified in Peabody by Camp, Dresser and McKee. Most of this information was available only through subdivision plans, as complete records have not been maintained by the city. All of the systems identified serve relatively small areas and are not considered to represent a threat to water quality.

Operation and maintenance of the stormwater system is the responsibility of the Highway Department. Currently the city has no street nor catch basin cleaning programs.

Recommendations include the following:

- The city should undertake a community-wide drainage study to determine the magnitude and characteristics of the city's stormwater collection system. Areas of priority include the Norris Brook-North Peabody areas.
- As either part of or a prerequisite of the study recommended above, the Highway Department should initiate an inspection survey to determine the locations of catch basins and outfalls from storm drains in the city.
- Based on the survey recommended above, the city should initiate, where necessary, a program of catch basin cleaning, outfall maintenance, street sweeping, and any other control measures deemed appropriate to remedy problems uncovered during the survey.
- In addition, the need and feasibility for neighborhood street cleaning and litter program should be evaluated.

III. ESTIMATED COSTS

Average Annual Local Costs are as follows:

(1) Sewerage	0	
(2) Septage Treatment	0	
(3) Stormwater	\$234,000	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Thirteen industries in Peabody have been identified as significant dischargers. Five of these; namely Fermon Leather Corporation, Inc., Remis Industries, Tan Rite Leather Corporation, Victory Leather Corporation and J.E.C. Tanning Company, were classified as significant because they discharge more than 50,000 gpd and their discharges may contain toxic wastes. Bond Leather & Splitting Company, Consolidated Color Corporation and N.H. Matz Leather were designated as significant because they may discharge toxic wastes. New England Carbide Tool Company and Stahl Finish may discharge to a watercourse without an NPDES permit. Three industries have been issued NPDES permits or have permit applications on file. These are Eastman Gelatin Corporation, Peabody Municipal Light and Beatrice Foods Company.

Recommendations to the city include the following:

- The city should update its existing sewer use law using the MAPC-Model Sewer Use Law as a guide. In any case, the city's sewer use law should be as stringent or more stringent than the SESD sewer use law. In addition, a drain layer's manual should be adopted to regulate the installation of sewer connections.
- New industries should be required to discharge sanitary and process wastewaters (with pretreatment, if required) to the sewer system. Water conservation and recycling of process wastewater should be encouraged.
- Two town industries identified as potential dischargers to watercourses should apply for NPDES discharge permits.

V. NON-POINT SOURCES

A. Landfills. The city of Peabody operates a landfill off Forest Street and Farm Avenue near the intersections of Routes 1 and 128. Sampling by the 208 staff indicated that surface leachate stream flowing south from the landfill to Cedar Pond had contributed to the degradation of the pond. The facility is presently under orders by the Mass. DEQE to develop engineering plans for closing the site.

Recommendations to the city are:

- The city should prepare engineering plans which should study surface and subsurface leachate problems so that control measures may be designed and included within the plans. The need for facilities to collect surface and subsurface leachate should be evaluated.

B. Salt Storage and Application. No pollution problems related to improper salt storage were identified.

The following program to prevent road salt contamination is recommended to all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

The existing floodplain/wetlands district needs to be extended to cover all wetlands in Peabody. In addition, Peabody should consider further protection with a stream/pond buffer district and a watershed protection district. However, a more comprehensive approach in the form of a water resource protection district would be considered.

Areas where the current zoning conflicts with the environmental capability of the land to support development should be rezoned for less intensive uses if they are not sewered.

VII. MANAGEMENT

The city of Peabody is currently engaged in a sewer construction program to sewer existing problem areas. This work, and the administration of the city's wastewater facilities is under the direction of the Department of Public Services. It is recommended, consistent with federal grant requirements, that the city review its sewer ordinance (adopted in 1969), and in doing so consider the model sewer use ordinance and drain layer's manual presented in this plan. The city's recently adopted sewer user charge bills

at a rate of 35¢/1,000 gallons of water consumption for both residential and industrial users. Considering the industries connected to the Peabody system, this charge system should be reviewed to determine if it adequately considers strength characteristics in its apportioning of O&M costs to sewer users. It should be noted that because extensive improvements to the SESD system are presently being carried out with federal and state construction grant funds, the district and its member municipalities must adopt sewer use regulations, develop and implement industrial cost recovery and user charge systems, and identify those industries which may require pretreatment to meet EPA regulations and/or guidelines. The District does not have the legal authority to make industrial cost recovery assessments or assess user chargers to individual users. However, in an effort to meet federal requirements that user charge and industrial cost recovery systems will be implemented, member communities, including Peabody, have assured EPA, in writing, that such systems will be implemented.

The Board of Health should initiate a vigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems, to requiring connection to the municipal system, if such a connection is feasible.

The city council should authorize the preparation of engineering studies to connect the leachate problem from the landfill. The Board of Health should monitor this activity to minimize adverse public health impacts and to insure state regulations are complied with. Active participation by the city in the work of the South Essex Solid Waste Council is also recommended.

The preventive land use control recommendations presented above should be reviewed by the planning board and conservation commission, and consistent with city goals and policies, presented to the city council for action.

PEABODY: IMPACT ASSESSMENT

Categories

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

No direct costs are anticipated beyond the extensions already planned. The exception is costs associated with stormwater management (which may already be included in local budgets.)

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of anticipated growth for Peabody there appear to be significant impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that positive impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extension of the wetland/floodplain district would have a positive effect of flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

C. Groundwater Impacts. Positive effects on groundwater could accrue in areas where groundwater favorability coincides with the extension of environmental zoning districts, such as Peabody's floodplain/wetland overlay districts. Because the environmental district imposes special constraints on development, it also functions, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental district is in effect.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future growth constitute a small amount of the acreage in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community.

One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitat.

The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The extension of Peabody's floodplain/wetland district would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

E. Air Quality Impact. It is anticipated the growth patterns projected as a continuation of existing trends, would have a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Peabody would be slight with development anticipated as a continuation of existing growth patterns. Open space parcels are located adjacent to areas zoned for moderately low residential density which, developed, would not adversely impact on the open space or recreation areas.

In addition, several scattered public and semi-public lands fall within the recommended extension of the environmental zoning overlay districts. The additional development constraints contained in this floodplain/wetlands district would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remains in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

B. Archaeological & Historic Impacts. One archaeological site is known in Peabody and is located within an area zoned for medium density residential use. Certainly when a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss of any archaeological (or historic sites) would be regional in significance.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 420 housing units anticipated for Peabody means that about 330 acres of residential land will be developed over the 20-year period.

Peabody allows a moderate amount of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, where low density residential development occurs in this city this may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the outlined environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

These factors would combine to affect a moderate amount of land, and thus reduce to some extent, construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the city and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle income families may become more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing. The process of cleaning up area waterways and water-bodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is necessary to determine the potential impact upon such manufacturing establishments.

Peabody has the third largest manufacturing employment base in the North Coastal region, with over 65 percent in water-intensive manufacturing firms. Further, in absolute numbers, this city has more of this type firm (65) than any other municipality in the North Coastal region. Certainly the potential exists here for severe impacts on manufacturing employment due to compliance with water quality standards. However, it appears that the numbers and percentages of water-intensive manufacturing employment would remain about the same through 1995, thereby indicating that the marginality of some of Peabody's "wet" industry would be compensated for by the majority of the viable ones. In addition, although some industrially zoned land falls within the recommended extension of Peabody's floodplain/wetlands districts, other areas in the community would be available for industrial expansion.

SALEM: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

A sewerage system serves about 97 percent of the city's population. Wastewater is discharged to the SESD Peabody-Salem interceptor and the SESD Salem pumping station, and pumped to the SESD outfall near Great Haste Island in Salem-Beverly Harbor.

The city's presently engaged in a three phase construction program to rehabilitate old sewers and to extend service to unsewered areas in western Salem. Wastewater from the city would be treated at SESD facilities under construction in Salem.

No recommendations beyond the on-going projects were considered necessary for the city.

II. STORMWATER MANAGEMENT

Comprehensive stormwater collection systems serve the developed areas of the city. Fifteen systems were identified by Camp, Dresser and McKee. Six of these discharge to the South River, three to Salem Harbor, five to the North River, and one discharges directly to the Danvers River.

Presently there are cross-connections between the stormwater and wastewater sewerage systems in the vicinity of Buffum and Dunlap Streets. Such cross connections will be eliminated as Salem continues its separation program.

The Department of Public Works carries out the maintenance and operation of the stormwater system. Catch basin cleaning is done on an annual basis.

Recommendations to the city include the following:

- All cross-connections between the stormwater and wastewater collection systems should be eliminated as soon as possible.
- Wood drains are in poor condition and should be replaced.
- Outfalls as well as catch basins should be inspected periodically to determine the need for cleaning or other maintenance.
- The need and feasibility for neighborhood street cleaning and litter programs should be evaluated.

III. ESTIMATED COSTS

Average Annual Local Costs are as follows:

- Sewerage	0	
- Septage Treatment	0	
- Stormwater	\$105,450	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Fifteen industries in Salem have been identified as significant discharges. Pioneer Tanning Company, Inc., Salem News Publishing Company, Inc., Salem Plating, and the GTE Sylvania, Inc. plant (121 Loring Ave.) were classified as significant because they may discharge toxic wastes. Two other GTE Sylvania, Inc. plants (Boston St. and 71 Loring Ave.) and Salem Suede, Inc. have discharges greater than 50,000 gpd. Dions Yacht Yard and Sunburst Fruit Juice, Inc. may discharge to a watercourse without a permit and are considered significant. Three industries were classified as significant because they discharge greater than 50,000 gpd and their discharge may contain toxic materials. These are J. Flynn & Sons, Inc., Hawthorne Tanners, Inc., and Leach-Heckel Leather Company. Two industries have been issued NPDES permits. New England Power Company and Salem Oil & Grease are permitted to discharge cooling water containing contaminants to Salem Harbor and the North River, respectively. The Cat Cove Marine Laboratories have applied for an NPDES permit to discharge to Beverly Harbor.

Recommendations to the city include the following:

- The city should update its existing sewer use law using the MAPC-Model Sewer Use Law as a guide. In any case, the city's sewer use law should be as stringent or more stringent than the SESD sewer use law. In addition, a drain layer's manual should be adopted to regulate the installation of sewer connections.
- New industries should be required to discharge sanitary and process wastewater (with pretreatment, if required) to the sewer system. Water conservation and recycling of process wastewaters should be encouraged.
- The industries identified as potential dischargers to watercourses should apply for NPDES discharge permits.

V. NON-POINT SOURCES

A. Landfills. The city of Salem operates a transfer station and refuse is presently being hauled to the SCA landfill in Amesbury.

B. Salt Storage and Application. No problems have been identified with respect to improper salt storage

The following program to prevent salt contamination is recommended to all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).

- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Areas currently zoned for industrial, commercial, and intensive residential uses which conflict with the environmental capability of the land to support that development should be rezoned for low density residential development, if they are not sewered.

VII. MANAGEMENT

The city of Salem is presently engaged in a three phase construction program to upgrade and extend its sewerage system. Consistent with this work, it has adopted a sewer use charge (due to become effective July 1, 1978) which will charge at a rate of \$.45/100 cu. ft. of water consumption for residential customers and \$.52/100 cu. ft. of water consumption for commercial customers. The city's wastewater facilities are administered by the Department of Public Works. The city's sewer ordinance was adopted in April 1976 and while it generally meets federal requirements should be reviewed against the model sewer use ordinance and drain layer's manual presented in this plan.

It should be noted that because extensive improvements to the SESD system are presently being carried out with federal and state construction grant funds, the district and its member municipalities must adopt sewer use regulations, develop and implement industrial cost recovery and user charge systems, and identify those industries which may require pretreatment to meet EPA regulations and/or guidelines. The District does not have the legal authority to make industrial cost recovery assessments or assess user charges to individual users. However, in an effort to meet federal requirements that user charge and industrial cost recovery systems will be implemented, member communities, including Salem, have assured EPA, in writing, that such systems will be implemented.

The city should continue its active participation in the planning for the city resource recovery project in Beverly.

SALEM: IMPACT ASSESSMENT

Categories

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

There are no direct cost impacts for the recommendations for the city of Salem for wastewater treatment. Stormwater management costs may already be largely included in local budgets.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the projected growth for Salem there appear to be slight impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

The amount of potential erosion areas affected by growth appears to be approximately 100 acres.

B. Flood Control Impacts. When assessing the potential effects of the future growth in terms of potential flood control problems, it appears that slight impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas and steep slope areas.

The extent of the flood control problem areas appears to be approximately 100 acres in Salem. More detailed review of these impacts should be addressed in the construction-phase work.

C. Groundwater Impacts. The projected growth for Salem appears to have negligible impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

A positive impact could result from the implementation of recommended land management controls. Revised land use controls could mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future growth constitute about one-quarter of the land in the community. The amount of potential wildlife habitat in the community appears to be about 1500 acres.

E. Air Quality Impact. It is anticipated with the growth patterns projected there will be a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Salem would be slight with development according to the projected future growth. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents. In a few areas in the basin, small open space parcels are adjacent to or surrounded by land zoned for commercial and industrial use. Impacts from this type of development on open space could be slightly negative, long-term, but primarily of local importance.

B. Archaeological and Historic. A review of the potential impacts of the future growth on existing archaeological and historic sites in Salem indicates that the growth pressure would create negligible impacts on sites.

C. Housing Impacts. There is little apparent difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The over 550 projected housing units anticipated for Salem means that over 100 acres of residential land will be developed over the 20-year period.

IV. ECONOMIC IMPACTS

A. Manufacturing. The process of cleaning up area waterways and water-bodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is necessary to determine the potential impact of these costs upon such manufacturing establishments.

With over 5400 manufacturing jobs, Salem has the second largest industrial employment base in the North Coastal basin. Nearly one-half of these jobs are in Salem's 51 water-intensive manufacturing firms. While the percentage of water-intensive manufacturing is projected to increase to almost 60% of all manufacturing, manufacturing will account for only 15% of total employment.

SAUGUS: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

a Sewerage system serves about 70 percent of the town's population. All wastewater is pumped to Lynn's outfall and discharged with Lynn's combined wastewater to Broad Sound without treatment. There are a number of bypasses and overflows in the sewerage system.

The bypasses and overflows would be eliminated after Saugus completes the 201 facilities plan. Also the discharge of raw sewage into Lynn Harbor would be stopped after a treatment facility, now under design, is constructed.

Several areas in Saugus have been identified as having problems with their septic systems. In most areas, problems are evidenced by surface seepage. Some of these areas are already planned for sewerage. For areas that are not programmed for sewerage, it is recommended that:

- The town should study the feasibility of constructing a package plant to serve Golden Hills area near the Wakefield-Melrose line.
- The town should extend sewers to Walden Pond Avenue and Great Woods Road to alleviate chronic septic system malfunctioning.
- The town should enforce a strict inspection and maintenance program for septic systems in areas that are not sewerage or programmed to be sewerage.

II. STORMWATER MANAGEMENT

The Department of Public Works is responsible for the operation and maintenance of the stormwater system. Catch basin cleaning is contracted out to a private company on an annual basis.

Recommendations include the following:

- A program of regular catch basin and outfall inspection should be undertaken by the DPW to determine the need for additional cleaning or other maintenance requirements.
- A survey of brooks, wetlands and small streams should be performed to determine the need for stream channel maintenance for both water quality and flood control purposes.
- The need and feasibility for neighborhood street cleaning and litter programs should be evaluated.

III. ESTIMATED COST

Average annual local costs are as follows:

(1) Sewerage	\$43,000	(Only existing problem areas to be sewerred)
(2) Septage	\$12,000	
(3) Stormwater	\$105,550	(Much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Three industries in Saugus have been identified as significant discharges. Eastern Industrial Oil Products Company was classified as significant because the firm may discharge to a watercourse without a permit. Eastern Tool & Stamping Company has been issued an NPDES permit for a discharge to the Saugus River. M. DeMatteo Construction Company has applied for an NPDES permit.

Recommendations to the town include the following:

- The town should adopt a sewer use law comparable to the model sewer use law developed by the MAPC. The adoption of a drain layer's manual to regulate the installation of sewer connections is also recommended.
- New industries should be required to discharge sanitary and process wastewaters (with pretreatment, if required) to the sewer system. Water conservation and recycling of process wastewaters should be encouraged.
- Industries discharging to watercourses should apply for NPDES discharge permits.

V. NON-POINT SOURCES

A. Landfills. Municipal refuse is hauled to the RESCO steam generator incinerator in the eastern part of town. Prior to joining the RESCO facility, the town of Saugus disposed of its refuse at a public landfill off Main Street at the southwestern edge of the Breakheart Reservation. Since the old landfill has not been properly closed, results of sampling of nearby streams indicate the presence of a severe and continuing impact on the marshes and waters surrounding the landfill.

Recommendations to the town are as follows:

- The old landfill facility should be properly graded and sealed as specified by DEQE regulations.
- The plans for closing the site should include an updated analysis of the quantity and quality of leachate flowing from the landfill.
- Leachate collection systems should be included in the closing plans for the old landfill, including those sections that will remain active and receive residue from the RESCO facility.

B. Salt Storage and Application. No problems have been identified with respect to salt storage in the town.

The following program to prevent road salt contamination is recommended to all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

A buffer zoning district of at least 100 feet should be established along the southwestern shore of Hawkes Pond in Saugus. Although this shoreline is already partly developed, no more development should be permitted in such a buffer district. Hawkes Pond, along with three other ponds, serves as a water supply reservoir for the City of Lynn.

Areas where the current zoning conflicts with the environmental capability of the land to support intensive development should be rezoned for low density residential development if sewers are not constructed.

VII. MANAGEMENT

The town of Saugus is engaged in 201 facilities planning for collection system improvements consistent with the proposed regional facility to be built in Lynn, serving Lynn, Nahant and Saugus. The town's collection system is administered by the Department of Public Works. Consistent with this 201 work, the town will adopt a sewer use ordinance and a user charge system which meet federal requirements. In formulating a sewer use ordinance, reference should be made to the model sewer use ordinance and drain layer's manual presented in this plan.

Intermunicipal service agreements are currently being prepared for the use of the regional facility in Lynn, serving Lynn, Saugus and Nahant. These agreements should be drafted to insure consistency with the requirements of section 208 (c) (2) of the FWPCA. They should obligate each community to enforce the federal requirements for user charges, industrial cost recovery, sewer system rehabilitation and sewer use ordinances. They should set average daily flow rates with provisions for peak flows and financial arrangements which allocate capital costs and annual operation and maintenance costs (in proportion to flow rates and strength as they relate to treatment costs) an administrative overhead charge provision may also be appropriate.

The possibility of constructing a package plant in Saugus may impose additional administrative burdens on the Department of Public Works in terms of assessing user charges and operating an industrial cost recovery system

for this package plant, which is compatible with the systems developed for the use of the regional facility. These factors should be considered in assessing the feasibility of a package plant.

The Board of Health should initiate a vigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems, to the connection of such systems to public sewers, where feasible.

The Board of Health and the Conservation Commission should monitor the old landfill to determine impacts on adjacent marshes and waterbodies and to insure compliance with DEQE regulations. The town should authorize funds for the development of plans for the site.

The town planning board, in conjunction with the conservation commission should evaluate the land use recommendations with respect to existing land use and natural features information in the community where these recommendations are consistent with community goals and policies, zoning changes should be presented for town meeting approval.

SAUGUS: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6 percent and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual change in the community's figure is the annual cost to the community and would be required each year of operation.

The average annual cost would be \$44,600 for Saugus, (not including stormwater costs), and this would result in an annual impact on the local tax rate of \$0.19. The annual operation and maintenance cost would be \$10,400.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for Saugus, there appear to be both negative and positive impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

In those areas where the use of sewer service has been recommended as a solution for water quality, erosion problems would be aggravated for those potential erosion lands. This increased problem could result in two ways; one being short-term in duration, while the other one would be a long-term consequence.

A short-term negative impact of using sewers in an area considered as having erosion potential is that during the construction phase of work there would be considerable disruption of the landscape. This removal of natural vegetation, plus the increased traffic for the construction work, would mean an increase in the potential for erosion.

An impact for erosion potential which would be of long-term significance in the use of sewers is that the density of land uses permitted in an area can be altered and increased with sewers. One effect of this change in permitted land uses would be that the more dense development would aggravate existing erosion problems. This impact would last as long as the development and would tend to be irreversible.

Different effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

The amount of potential erosion areas affected by the recommendations in Saugus appears to be approximately 35 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effects.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that both positive and negative impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

In those areas which are considered as having potential flood control problems, the use of sewers as outlined would increase the potential problems. This would be an adverse consequence of this water quality management program which would be long-term in duration. The opportunities for reversing such impacts once they have taken place would appear to be limited, although the use of sewers as a solution for water quality permits an area to accommodate a broader range of densities of land uses, without potential water quality degradation problems. Since an area with potential

flooding problems should be maintained in its natural state as much as possible, so as to minimize flooding; the increased density of development in areas of sewer service would mean potentially increased flood control problems.

The adoption of the environmental district to protect its salt marshes would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for Saugus appear to have both negative and positive impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

In undeveloped areas outlined for the use of sewers or a package plant, there could be an accompanying increase in residential density from low to moderate density. Reduced development costs resulting from such a density change could increase the probability of development. Sewers in areas of groundwater favorability could mean that the water used in these areas would no longer be recharged to the ground; rather it would be carried out of the community, thereby greatly reducing groundwater recharge in these areas. Also, with increased development comes increased consumption of the groundwater through local wells. Negative effects could result on the recharge capacity of these areas and also present contamination problems since any effects created could continue to occur throughout the lifetime of that development. Due to the low probability of reversing this type of effect once it is established, this impact could constitute an irreversible commitment of groundwater resources. The results of a negative impact might not be limited to a single area or community, since many communities utilize groundwater supplies common to more than a single town.

However, some positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as floodplain and wetland overlay districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations do constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitat. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be long-term consequences. Primarily, this can be viewed as a local impact.

Areas outlined for sewer service would negatively affect wildlife by diminishing the capacity of the habitats to support wildlife. However, one positive effect could be that if growth and density was increased in the sewer service or package plant area, by clustering growth there, then the total amount of land needed to accommodate growth, in a more dispersed pattern, would be reduced. In this way more land could remain as potential wildlife habitats by remaining in a natural and undeveloped state.

The extended use of floodplain/wetland districts in Saugus would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

The amount of potential wildlife habitat affected by these recommendations appears to be about 550 acres.

E. Air Quality Impacts. It is anticipated with the growth patterns projected in the recommendations, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the recommendations will have a negligible impact on air quality.

One short-term effect which would be very localized in significance would be that the level of particulate matter in the atmosphere would be expected to rise temporarily during the construction phase of the sewerage expansion because of the truck transportation of materials and supplies to and from the construction sites.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands would be moderate with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents. Breakheart Reservation in Saugus has been preserved as significant open spaces for active and passive recreation. Potential impacts from projected high density residential development, or industrial development along the periphery of these areas, would be indirect and minimal.

In Saugus, several scattered public and semi-public lands fall within environmental zoning overlay districts. The additional development constraints contained in this floodplain district would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay district remains in force and would be an impact of local significance. In the case of this overlay zoning district, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

Development pressures could increase if sewers or package plants were built in presently undeveloped areas, resulting in greater use of open space for recreation. It should be noted that, while sewer construction would allow for higher residential densities, if the projected population growth remains about the same, that growth could be accommodated on less total acreage, thus leaving more open land for recreation and aesthetic enjoyment. (See the phased growth management system as discussed in Part II, Section 5.) Impacts would be long-term and of local significance.

In several places in Saugus where open space could be affected by development the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, commercial, or moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. Adjacent to the Saugus Iron Works is a parcel zoned for medium-high density residential use and another site is the Boardmen House which is adjacent to an area with medium density residential zoning. Residential uses would not create adverse impacts on these historic sites.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on other archaeological or historic sites and these should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 1180 housing units anticipated for Saugus means that 750 acres of residential land will be developed over the 20-year period.

Saugus allows some low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, where low density development occurs in this town there may be a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

The reduction in residential lot sizes that could accompany the introduction of sewers as recommended might permit the construction of more moderately-priced housing. In terms of alleviating the short supply of such housing, locally and regionally, such an outcome would produce a positive impact. Average on-site land costs may be reduced from \$17,000 - \$22,000 under basic one acre requirements to \$11,000-\$15,000 under medium density requirements. This is a significant reduction that, together with the advent of sewers, would enhance development potential significantly.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal would increase housing costs.

These factors would combine to affect a moderate amount of land, and thus reduce somewhat construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle income families may become difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. Saugus has about 60 jobs in water-intensive employment, which is expected to increase to 135 jobs by 1995. As a percentage of total employment, this is about one percent.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

SWAMPSCOTT: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

A sewerage system serves about 98 percent of the town's population. All wastewater is discharged to Nahant Bay, following treatment at the municipal treatment facility.

There are only two areas presently experiencing septic system failure problems. The town is currently planning to extend the sewer system to these areas which are located near Galloupes Point and Foster Road.

Recommendations to the town include the following:

- The town should resolve with EPA the issue of NPDES permit requirement for a secondary treatment facility.
- The town should conduct a study to demonstrate whether there is any need for secondary treatment or whether the existing primary treatment is adequate to meet the effluent standards for discharge.

II. STORMWATER MANAGEMENT

Swampscott is served by an extensive stormwater collection system. Four major discharges were identified by CDM. Three of the discharges are located on Nahant Bay. The fourth discharge is to Massachusetts Bay at Phillips Beach. Two of the three discharges to Nahant Bay are located at Fishermans Beach. The third is located at Kings Beach. The discharge to Kings Beach also contains combined sewage from Lynn.

The Department of Public Works is in charge of the operation and maintenance of the stormwater system. Catch basin cleaning is done twice a year and lines are flushed as required. Recommendations to the town include:

- Eliminate the combined sewer discharge from Lynn.
- Evaluate the need for outfall control structures or an outfall maintenance program to protect the beaches.
- The need and feasibility for neighborhood street cleaning and litter programs should be evaluated.

III. ESTIMATED COSTS

Average annual local costs are given below:

(1) Sewerage	0	(no sewers beyond what is already planned or recommended)
(2) Septage	0	
(3) Stormwater	\$52,200	(much of this cost already may be included in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

One industry in Swampscott has been identified as a significant discharger. The Lynn Sand and Stone Co. has been issued an NPDES permit for the discharge of concrete slurry and cooling water to Fosters Dam Pond.

Recommendations to the town include the following:

- 1) The town should adopt a sewer use law comparable to the model sewer use law developed by the MAPC. A drain layer's manual should be adopted to regulate the installation of sewer connections.

V. NON-POINT SOURCES

A. Landfills. No pollution problems attributable to landfill leachate have been identified in the town.

B. Salt Storage and Application. No pollution problems attributable to salt storage practices have been identified in the town.

The following program to prevent salt contamination is recommended to all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Land use development controls in Swampscott are presently adequate to address water quality. However, the town should consider rezoning in certain areas currently zoned for commercial and medium density residential development which is not compatible with the environmental capability of the land to support that intensity of development.

VII. MANAGEMENT

The Clean Water Act of 1977, amending the Federal Water Pollution Control Act, allows a modification of the secondary treatment requirement for discharges

into marine waters if certain criteria can be met. This provision was not envisioned to apply to discharges on the east coast, and EPA has indicated that it will be very strict in its application. The town should discuss with EPA the possibility of utilizing this provision, and if that possibility exists then the town should authorize the funds to conduct the feasibility studies for not going to secondary treatment. Swampscott's wastewater facilities are administered by the Department of Public Works.

If Swampscott is required to construct a secondary treatment facility and utilize state and federal construction grant funds then federal requirements for an acceptable user charge system and an acceptable sewer use ordinance would have to be met. Even without such construction Swampscott should amend its present sewer use ordinance (adopted in 1972) to at least conform with the model ordinance of the MDWPC and should, in developing such an ordinance, refer to the model sewer use ordinance and drain layer's manual presented in this plan.

SWAMPSCOTT: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

There are no direct wastewater treatment cost impacts resulting from the water quality recommendations outlined. (Stormwater management costs already may be largely in local budgets.)

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the future projected growth for Swampscott, there appears to be negligible impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

The amount of potential erosion areas affected by possible growth appears to be approximately 10 acres.

B. Flood Control Impacts. When assessing the potential effects of future growth in terms of potential flood control problems, it appears that negligible impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas and steep slope areas.

The extent of the flood control problem areas appears to be about 10 acres in Swampscott.

C. Groundwater Impacts. The growth projected for Swampscott appears to have negligible impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

A positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future growth do not constitute a significant amount of the area in the community.

E. Air Quality Impact. It is anticipated with the growth patterns projected, there will be a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Swampscott would be negligible with the development projected.

However, it also should be noted that where the permitted residential density would be decreased, according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. A review of the potential impacts of future growth on existing archaeological and historic sites in Swampscott indicates that the growth pressure would create minimal impacts on the sites.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth projected in terms of the amount of land available in Swampscott. The projected 760 housing units anticipated means that 350 acres of residential land will be developed over the 20-year period.

IV. ECONOMIC IMPACTS

A. Manufacturing. The process of cleaning up area waterways and water bodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is necessary to determine the potential impact of these costs upon such manufacturing establishments. Because cost impacts ultimately will affect jobs, it is important to estimate what firms may be most affected by the requirement of the water quality plan.

Since Swampscott has 100 manufacturing jobs, of which over 90 percent are in water-intensive categories, it is not expected for water quality requirements to have a significant impact on this employment.

WAKEFIELD: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

A sewerage system serves about 96 percent of the town's population. All wastewater is discharged to the Metropolitan Sewerage District for treatment at the Deer Island treatment facility. No problems have been identified in the Wakefield sewerage system.

The present practice by the Board of Health to enforce strict inspection and maintenance programs for septic systems is satisfactory. Since all existing problem areas are already proposed to be sewerred, no additional recommendations are needed for the town.

II. STORMWATER MANAGEMENT

Operation and maintenance of the stormwater system is the responsibility of the Highway Department. Catch basins are cleaned regularly, and other preventive maintenance is also performed. Recommendations to the town include the following:

- Outfalls and receiving streams should be inspected to determine the need for outfall and channel maintenance.
- In site planning for future land development, maximum use should be made of the existing stormwater systems, natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

Average annual local costs are as follows:

(1) Sewerage	0	(no additional sewerred beyond what is already planned is recommended)
(2) Septage	0	
(3) Stormwater	\$134,400	(much of this cost may already be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Three industries in Wakefield have been identified as significant dischargers. Wakefield Bearing Co. has been issued an NPDES permit for the discharge of un-contaminated cooling water to Wakefield Brook. Spir-It, Inc. and Power Products have NPDES permit applications on file for discharges to the Mill River and the Saugus River, respectively.

Recommendations to the town include the following:

- 1) The town should adopt a sewer use law comparable to the model sewer use law developed by the MAPC. In addition, a drain layer's manual should be adopted to regulate the installation of sewer connections.
- 2) New industries should be required to discharge sanitary and process wastewater (with pretreatment, if required) to the sewer system. Water conservation and recycling of process wastewater should be encouraged.

V. NON-POINT SOURCES

A. Landfills. No pollution problems attributable to landfill leachate have been identified in the town.

B. Salt Storage and Application. No pollution problems attributable to salt storage practices were identified in the town.

The following program to prevent road salt contamination is recommended to local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Land use development controls in Wakefield are presently adequate to address water quality although a stream/pond buffer district and/or a watershed protection district could be considered for the future.

VII. MANAGEMENT

As no problems have been identified in the Wakefield sewerage system, wastewater management recommendations are minimal. However, because the community is connected to the MSD, the community will be required to implement and maintain a user charge and industrial cost recovery billing and collection system, which must be approved by the MDC and EPA. Additionally, once MDC promulgates presently proposed rules and regulations covering discharge of sewage, drainage, substances of wastes to the MSD system, communities will be required to have in effect a sewer use bylaw or ordinance no less stringent than the regulations of the MDC. These requirements will place significant administrative and management burdens

on Burlington. Reference should be made by Wakefield to the model sewer use ordinance and drain layer's manual presented in this plan.

The present strict enforcement by the Board of Health of its regulations for septic tanks and cesspools should be continued for the small percentage of remaining on-lot systems in the community.

The planning board should consider proposing for town meeting approval a stream/pond buffer district or watershed protection district.

WAKEFIELD: IMPACT ASSESSMENT

Categories

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space & Recreation
- B. Archaeological & Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

There will be no direct costs associated with recommendations except those associated with stormwater management, much of which is already in local budget.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the anticipated growth in Wakefield there appear to be moderate impacts. Potential erosion problems could occur in areas of steep slope, erodable soils or sparse vegetation.

The amount of potential erosion areas affected appears to be approximately 150 acres.

B. Flood Control Impacts. When assessing the potential effects of projected development to 1995 in terms of potential flood control problems, it appears that moderate impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extent of the flood control problem areas appears to be about 150 acres in Wakefield.

C. Groundwater Impacts. Future growth as a continuation of existing trends would have moderately negative impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Wakefield employs environmental zoning in the form of a floodplain district which protects some areas of high groundwater favorability there are still areas that remain available for development.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future growth constitute a small amount of the land area in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community.

One result of this dispersed-type of growth is that some urban development appears in areas rated as potential wildlife habitats at the present time, and further reduces their capacity to provide habitat.

The potential impact on wildlife habitats although small could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

E. Air Quality Impacts. It is anticipated with growth pattern projected as a continuation of existing trends, that impacts on air quality would be negligible.

III. SOCIAL IMPACTS

A. Open Space & Recreation Impacts. Generally, impacts on public and semi-public lands in Wakefield would be slight with development according to existing trends.

In Wakefield, the Town Forest is adjacent to land zoned for high density residential development. Impacts on this open space from high density residential development could be somewhat negative. Many more residents would have access to these open areas for recreational purposes. These impacts would be long-term in duration, of local significance, and they would mean an irreversible commitment of resources.

In Wakefield, a few open space areas identified in the assessment fall within the flood plain district. The additional development constraints imposed by the district regulations would enhance open space or recreational areas, and would result in a positive impact on such areas. The impact would continue as long as the overlay districts remains in force, and this would constitute an impact of local significance. In the case of overlay districts, there is a strong, positive relationship between the short-term use of the man-made environment and the enhancement of the long-term productivity of the natural environment.

B. Archaeological & Historic Impacts. A review of the potential impacts on existing archaeological sites in Wakefield indicates the growth pressures would create negative impacts on only a couple sites. These sites are zoned for high density residential development; or they are adjacent to such uses. Certainly when a site is actually developed, the impact is significant and

long-term, and the commitment is irreversible. The loss of any of the archaeological or historic sites would be regional in significance.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

C. Housing Impacts. Wakefield allows for a variety of housing types, including multi-family housing and construction on small lots. Therefore, housing impacts would be negligible.

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. Wakefield has about 380 jobs in water-intensive employment which is expected to decrease to about 300 jobs by 1995. As a percentage of total employment, this is between 3 and 4 percent.

Reference should be made to the MDC/EMMA study for a full discussion of manufacturing employment impacts.

SUASCO BASIN OVERVIEW

A. A PROFILE OF THE SUASCO BASIN

The SuAsCo River Basin is located in the west quadrant of the MAPC 208 study area. The watershed which is a sub-basin of the Merrimack River Basin is bounded by the Charles River Basin to the east and south, the Mystic and Shawsheen River Basins to the north, the Nashua River Basin to the west, and the Blackstone River Watershed to the south. Fourteen communities lie largely or wholly within the SuAsCo Basin. They are:

Acton	Framingham	Marlborough	Sudbury
Ashland	Hopkinton	Maynard	Wayland
Bedford	Hudson	Southborough	
Concord	Littleton	Stow	

Five other communities which lie partially within the watershed may be mentioned in this section, but they will be discussed in fuller detail in other basin sections. They are:

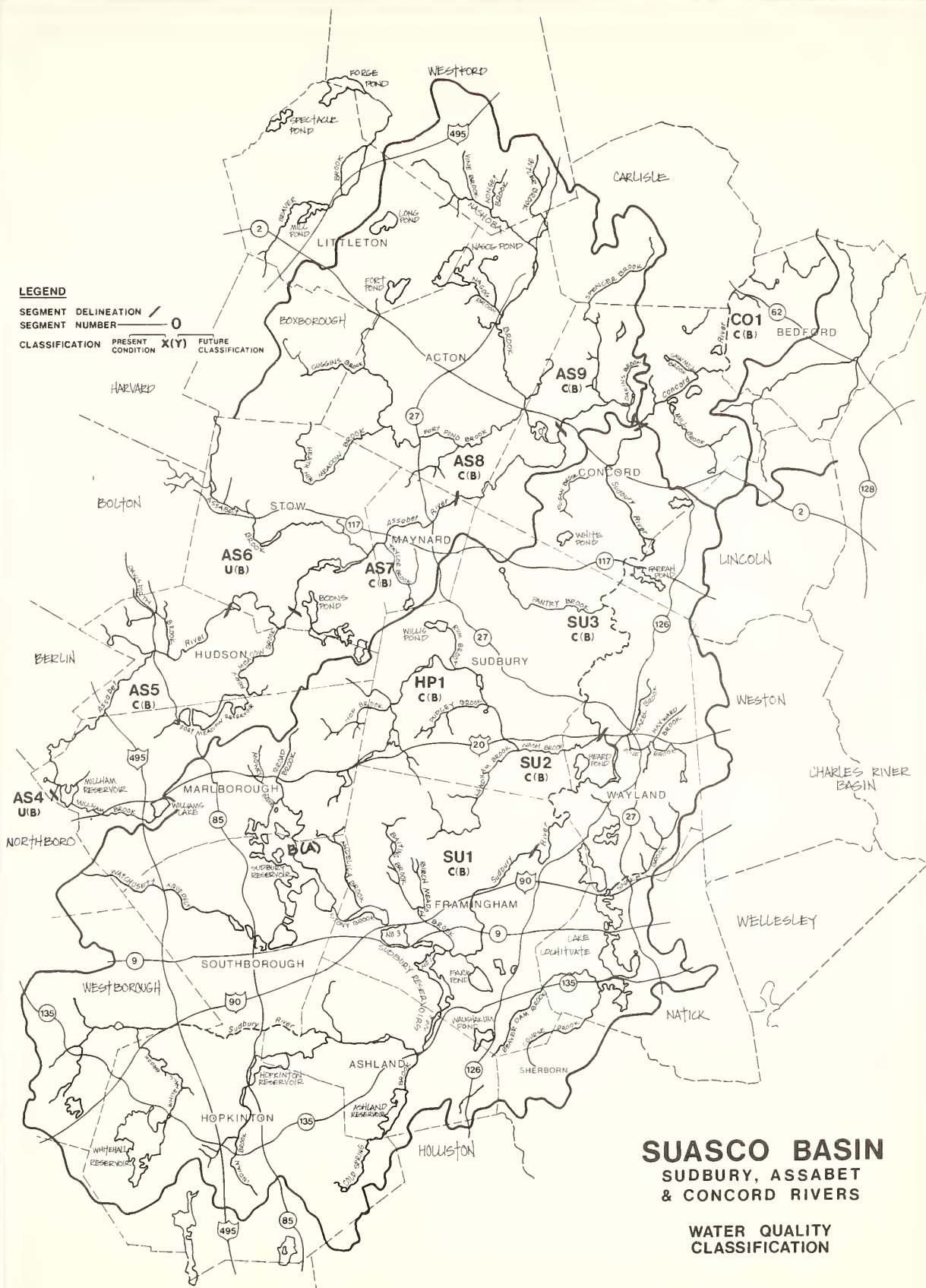
- Holliston and Sherborn in the Upper Charles Basin section, and
- Lincoln, Natick, and Weston in the Lower Charles Basin section.

The SuAsCo Basin can be generally characterized as a rapidly growing, relatively affluent group of communities undergoing land-intensive, sub-urban development, chiefly for low to moderate density, residential use. The combination of an abundance of developable land and good accessibility via Routes 2 and 9 as well as Interstates 90 and 495 has contributed to making the basin a highly attractive place in which to live. With the exception of Maynard, most of the towns within the basin doubled or nearly doubled in population between 1950 and 1970. The more rural towns such as Sudbury, Acton, and Wayland experienced the greatest increases in population (at least tripling in size). The older, more urbanized towns of Marlborough and Maynard experienced moderate population increases between 1950 and 1970. Relatively rapid growth, a 39 percent increase, is expected for the twenty-five year period, 1970 to 1995. Population would go from 220,201 persons in 1970 to 306,450 persons in 1995. Acton, Concord, Littleton, Stow and Sudbury again would experience the greatest population increases (over 50 percent) while Bedford and Maynard would grow only 18 percent and 13 percent, respectively. The other basin communities would increase between 25 and 45 percent between 1970 and 1995.

Economic growth is expected to continue in almost all sectors through 1995. The most significant increases in employment (over 100 percent) are in the construction, trade, services and transportation sectors. In 1975, about 80 percent of jobs in manufacturing are in dry manufacturing. The remaining 20 percent of manufacturing jobs are in water-intensive industries. Manufacturing employment as a whole accounts for 40 percent of total employment and is expected to increase by only 6 percent (or 2433 new jobs) between 1975 and 1995. Manufacturing jobs are concentrated in Bedford, Framingham,

LEGEND

SEGMENT DELINEATION /
 SEGMENT NUMBER 0
 CLASSIFICATION PRESENT X(Y) FUTURE CLASSIFICATION



SUASCO BASIN **SUDBURY, ASSABET** **& CONCORD RIVERS** **WATER QUALITY** **CLASSIFICATION**

0 4000 8000 16000
 SCALE IN FEET



SOURCE: BASE MAP, U.S. GEOLOGICAL SURVEY
 DATA: "CLASSIFICATION & SEGMENTATION OF MASS
 RIVER BASINS & COASTAL ZONES" D.W.P.C., 1976.

CHANGES IN COMMUNITY POPULATIONS AND PROJECTIONS: SUASCO

AREA	1950 ¹	1960 ²	% Δ '50 '60	1970 ²	% Δ '60 '70	% Δ '50 '70	1975 ³	1980 ⁴	1985 ⁴	1990 ⁴	1995 ⁴	% Δ '70-'95
ACTON	3,510	7,238	106.2	14,770	104.0	320.8	18,200	20,750	23,000	25,000	26,250	77.7
ASHLAND	3,500	7,779	122.3	8,882	14.2	153.8	8,900	9,500	10,300	11,500	12,500	40.7
BEDFORD	5,234	10,969	109.6	13,513	23.2	158.2	12,300	12,500	13,200	14,500	15,900	17.7
CONCORD	8,623	12,517	45.6	16,148	29.0	87.3	17,300	19,100	21,300	23,000	24,500	51.7
FRAMINGHAM	28,068	44,526	58.6	64,048	43.8	128.2	72,400	79,000	80,900	81,500	82,000	28.0
HOLLISTON	3,753	6,222	65.7	12,069	94.0	221.6	13,000	14,500	16,100	17,900	19,000	57.4
HOPKINTON	3,486	4,932	41.5	5,981	21.3	71.6	6,400	6,200	6,500	7,200	7,800	30.4
HUDSON	8,211	9,666	17.7	16,084	66.4	95.9	16,500	17,500	18,800	20,300	22,000	36.8
LINCOLN	2,427	5,613	131.3	7,567	34.8	211.8	6,500	6,400	7,000	7,700	8,800	16.3
LITTLETON	2,349	5,109	117.5	6,380	24.9	171.6	6,800	7,200	7,900	8,800	9,900	55.2
MARLBOROUGH	15,756	18,819	19.4	27,936	48.4	77.3	30,500	32,800	35,200	37,700	40,000	43.2
MAYNARD	6,987	7,695	10.3	9,710	26.2	39.2	9,900	10,100	10,400	10,800	11,100	13.3
NATICK	19,838	28,831	45.3	31,057	7.7	56.5	31,100	31,800	33,000	34,300	35,100	13.0
SHERBORN	1,245	1,806	45.1	3,309	83.2	165.8	4,200	4,500	4,800	5,000	5,100	54.1
SOUTHBOROUGH	2,760	3,996	44.8	5,798	45.1	110.1	6,400	5,800	7,300	7,800	8,300	43.2
STOW	1,700	2,753	51.3	3,984	44.7	134.3	4,700	5,000	5,400	5,900	6,400	60.6
SUDBURY	2,596	7,447	186.9	13,506	81.4	420.3	15,100	18,500	20,300	21,300	21,800	61.4
WAYLAND	4,407	10,444	137.0	13,461	28.9	205.4	13,300	15,000	16,000	17,000	18,000	33.7
WESTON	5,026	8,261	64.4	10,870	31.6	116.3	11,500	12,500	13,500	14,000	14,500	33.7
TOTAL	129,476	204,623	58.0	285,073	39.3	120.2	305,000	328,650	350,900	371,200	388,950	36.4

1 U.S. Census of Population

2 U.S. Census of Housing

3 State Census

4 CTPS Projections

and Maynard; they account for over half of all manufacturing jobs in the basin. Water-intensive industries are found in several of the basin communities.

Housing construction in the SuAsCo Basin has been mainly single-family housing units on lot sizes varying from one quarter acre to one acre. Multi-family housing has been built in all of the basin communities, although over 60 percent can be found in Marlborough and Framingham. The greatest amount of housing construction (65 percent of which was multi-family between 1970 and 1975) is occurring in Acton, Concord, Framingham, Marlborough, and Sudbury, although all the basin communities (with the possible exception of Maynard) are experiencing significant residential growth pressures. In the smaller or more rural communities such as Ashland, Littleton, Southborough, and Stow, residential development (mostly single-family) has been land consumptive because of their large lot zoning requirements.

Commercial development within the SuAsCo Basin is concentrated in a few suburbanized towns and has occurred in "strip" fashion along major arterials. The large shopping center such as Shopper's World in Framingham and the recent commercial development along Route 119 in Acton are examples of this type of development. Additional commercial activity can be found within many of the town centers of the older more developed suburban communities such as Ashland, Hudson, Concord, and Littleton. Basinwide, commercial land use constitutes only about one percent of total land use. Industrial land use increased by nearly 200 percent in the basin between 1951 and 1971. The Town of Bedford experienced the largest increase in industrial land use (435 acres between 1951 and 1971).

Approximately one half of the SuAsCo Basin residents are served by public sewer systems. Ashland, Bedford, and Framingham are members of the South Metropolitan Sewerage District (MSD) of the Metropolitan District Commission. Hudson, Marlborough and Maynard treatment plants discharge to the Assabet River, while Concord's discharges to the Great Meadows Wildlife Refuge bordering the Concord River. SuAsCo Basin residents not served by public sewers, approximately 49 percent, are served by private septic tanks or cesspools.

The basin's climate is classified as humid continental. The average annual temperature is 50 degrees F, with summer temperatures averaging between 67 - 70 degrees F and winter temperatures averaging 30 degrees F. Total precipitation is between 40 and 45 inches annually. Prevailing winds are generally from the west, from the northwest in the winter and southwest in the summer.

The topography of the basin can be described as gently rolling with scattered hills. The eastern portion of the watershed is primarily a flat valley with gentle hills having only a 5 to 10 percent slope; while the western portion rises in altitude and has a greater relief due to its steeper slopes and ridges. This variety of basin topography is the result of glacial activity. The predominant soils of the basin, the result of glacial activity, range from loam to sandy loam and silt to coarse gravel. These are moderately to well drained soils or poorly drained due to hardpan or bedrock. The muck and peat soils, predominant in the wetlands, are found throughout the basin and are characterized by poor drainage.

A large percentage of the watershed is still covered by woodlands and a smaller portion is covered by inland wetlands vegetation. In the moderately to well

drained uplands, the dominant species are white pine, sugar maple, hickory, grey birch, poplar and oak. In the swamps and wet areas, red maple is the dominant species.

The low residential density in western portions of the basin and the large areas of undeveloped land help support a wide variety of wildlife species. Otherwise, those species found in eastern Massachusetts are those that have not been forced westward or northward by the heavy pressures of urbanization and those that have adapted to the altered environment. Examples include raccoons, rabbits, gulls and other small mammals and birds. The outstanding landscape characteristics in the basin include sections of meandering streams, waterbodies, wooded uplands and drumlins.

B. WATER QUALITY STANDARDS AND CLASSIFICATIONS

The fourteen towns included in the SuAsCo Basin Report are drained primarily by three rivers, the Sudbury, Assabet and Concord. Present water quality conditions range from fair to poor (C or lower) in all three rivers.

The three rivers included in this discussion exhibit similarities in many regards. This might be expected as a result of their geologic development and setting and further as a result of fairly similar manmade developments. Each of the rivers is also plagued with similar pollution problems including: raw sewage discharges via overflows, failing septic systems, industrial discharges, stormwater runoff, landfill leachates, dredging and filling in both stream channels and natural wetlands, and some siting of large impermeable types of developments on wetlands, marshes and natural recharge areas.

The SuAsCo Basin is a sub-basin of the greater Merrimack River Watershed. The Sudbury and Assabet Basins drain into the Concord River which in turn drains into the Merrimack River at Lowell. The Merrimack River flows easterly and meets the ocean at Newburyport.

The Sudbury River begins in a system of brooks which flow from an elevation of four to five hundred feet into extensive wetlands in Westborough, known as Cedar Swamp. The river then flows easterly and northeasterly for some 36 miles and is joined by twenty major tributaries which drain approximately 163 square miles of all or portions of the following towns: Westborough, Southborough, Hopkinton, Ashland, Holliston, Sherborn, Natick, Framingham, Marlborough, Weston, Wayland, Sudbury, Hudson, Lincoln, Maynard and Concord.

The headwaters of the Assabet River, like those of the Sudbury, rise as brooks at an elevation of 400 to 500 feet. These brooks drop down to wetlands in Westborough, known as Assabet Swamp. The northerly and northeasterly course of the river is swelled by fourteen tributaries as it flows 31 1/2 miles to join the Sudbury. The river drains approximately 176 square miles of all or portions of the following towns: Grafton, Westborough, Shrewsbury, Northborough, Boylston, Marlborough, Berlin, Clinton, Bolton, Hudson, Harvard, Stow, Maynard, Boxborough, Acton, Littleton, Westford, Carlisle, and Concord.

The Concord River is formed by the confluence of the Sudbury and Assabet Rivers in Concord. Flowing northerly for 16 miles and joined by 13 tribu-

taries, it has a comparatively small watershed, draining only some 64 square miles of all or portions of the towns of Concord, Bedford, Carlisle, Westford, Billerica, Chelmsford, Tewksbury, and Lowell.

Besides the major watercourses described above, there are a large number of surface waterbodies located throughout the basin. Sizes range from a few acres to over 200 acres, although nearly half are less than ten acres in size. However, the Whitehall and Sudbury Reservoirs are over 500 acres and 100 acres in size, respectively.

The water quality goal for each of these rivers is mainly Class B water, the equivalent of "fishable/smimmable" as referred to in the Federal Water Pollution Control Act. The Massachusetts Division of Water Pollution Control (DWPC) has designated all surface waters in this basin as Effluent Limited. The definition of Effluent Limited implies that the water quality goal can be met through the application of "Best Practicable Waste Treatment Technology" as defined in EPA's guidelines.

In effect, this means that the public and private entities in the SuAsCo Basin have it within their capability to bring the waters up to standard by using existing technology and management practices. These may include, as appropriate: upgrading wastewater treatment to the secondary level, elimination of raw wastewater discharges, correction of failing septic systems, elimination of industrial discharges and other measures within current technological capability.

The following sections describe each of the rivers in terms of their setting, current water quality and sources of pollution.

Sudbury River

The Sudbury River is 41 miles long with a drainage area of 169 miles, 29 of which drain to the MDC reservoirs. The Sudbury River rises from Rutters, Denny, Jackstraw and Picadilly Brooks in Westborough and Hopkinton. The streams join in Cedar Swamp forming Cedar Swamp Pond. The outflow of the pond, generally acknowledged as the beginning of the Sudbury River, is shortly joined by the Whitehall Brook. From its headwaters, the river, narrow at this point, flows rapidly and easterly through Hopkinton and Ashland. Indian Brook, which drains from Hopkinton Reservoir, joins the river in Ashland. As the river turns from an easterly to a northerly direction, Cold Spring Brook, surrounded by wetlands, joins the river from the south. Below the confluence of Cold Spring Brook, the river flows into Framingham where it is joined by the waters of the Metropolitan District Commission Reservoirs 1,2, and 3 and the Sudbury Reservoir in Southborough. From Reservoir 1, the river flows easterly, then northerly. Eames Brook, which drains Farm Pond, joins the river from the south. The river continues its northerly flow to the Saxonville Dam.

From its source to the Saxonville Dam, water quality in the Sudbury River and its tributaries is fair, suitable as a habitat for fish and wildlife indigenous to the region, suitable for recreational boating and fishing, and under emergency conditions, suitable for public water supply with treatment and disinfection. Trout are stocked annually in this section of the river by the Division of Fisheries and Wildlife. These conditions generally conform to Class C water quality standards.

This segment of the river showed high coliform bacteria levels, especially in the heavily populated areas of Ashland and Framingham. Urban runoff, septic leachate, or wastewater sewer overflows were the probable sources of the bacteria in the stream. Dissolved oxygen levels were found to be well below the designated Class B criteria.

Below the Saxonville Dam, the river, which is wide and meandering, flows northerly through the Saxonville section of Framingham. Cochituate Brook, draining from the most northerly of the three ponds of Lake Cochituate, joins the river here. The river flows through Pod Meadow in Wayland. Another small brook nearly connects the river with the northernmost point of Lake Cochituate. Between Sudbury and Wayland the river flows in a somewhat easterly direction. The extensive marshland, the Great Meadows National Wildlife Refuge, begins along the south shore, then gradually envelops both sides of the river as it continues its northerly flow through Wayland. Just downstream of where Route 20 and the Boston and Maine tracks cross the river, Wash Brook joins the river, draining the wetlands to the west.

This segment of the Sudbury is greatly affected by the meadowlands which border it. The dissolved oxygen levels approach zero during periods when the meadowlands are draining into the main channel of the river, carrying organic matter which creates an oxygen demand in the river. This phenomenon is believed to be a natural occurrence. Coliform bacterial levels from the swamplands were high in this segment, according to the DWPC survey done in 1973. Water quality in this section is fair, conforming to class C standards. Present uses include boating, fishing, and fish and wildlife propagation.

Flowing north through the meadowlands in Sudbury and Wayland, the river divides to rejoin after forming a small island. From there, the river flows through Sedge Meadows. It is soon joined by two small tributaries from the west, the larger one known as Bridge Brook. Further downstream, Pantry Brook, flowing through an extensive wetlands area including the Pantry Brook Wildlife Management Area, meets the river. The river is bordered for most of this distance by the Great Meadows National Wildlife Refuge, which is known locally as Weirs Meadows. The river flows north to Fairhaven Bay.

Jennie Brook joins the river from the west, just south of Route 2 and flows through Concord. The river continues to flow through wetlands to the confluence of the Sudbury and Assabet Rivers. As the two rivers meet at Egg Rock, the Concord River begins.

Water quality in this portion of the Sudbury River continues to be dominated by the meadowlands on both banks of the river. There is a continuation of the dissolved oxygen problem found further upstream which is associated with the drainage from the swamps. The meadowlands provide oxygen demanding inorganic material. Coliform bacteria levels are high, and there is a moderate nutrient problem. In a statewide pesticides study conducted by the Division of Fisheries and Game between 1963 and 1971, fish caught in the Sudbury River showed pesticide levels among the highest in the state. This was the outcome of analyzing 93 sample locations throughout the Commonwealth. Present uses in the downstream section of the river include recreational boating and fishing and fish and wildlife propagation. These conditions presently conform to Class C water quality standards.

The Sudbury River has no municipal sewage treatment plant discharging to its main stem. The Raytheon Corporation in Wayland Discharges a treated effluent to the river. The Marlborough East STP discharges to Hop Brook, a tributary to the Sudbury River. Hop Brook becomes known as Wash Brook as it flows through Wayland to its confluence with the Sudbury River. The brook is a series of millponds which receive the treatment plant effluent at the headwaters of the first pond.

The benthic release of nutrients, considered to be the most significant problem affecting the brook, is expected to continue for a number of years, continuing to produce eutrophic conditions in the ponds. As the brook flows through a densely populated area in the Town of Sudbury, high coliform counts were found, probably from individual septic systems. The proposed classification for Hop Brook is B, but surveys showed that the water quality did not meet the B classification.

Assabet River

The Assabet River is thirty-one miles long and has a drainage area of 175 square miles. The river is characterized by the following repeated sequence: a sewage treatment plant discharging effluent into the headwaters of an impoundment. The impoundments are highly eutrophic with large amounts of aquatic growth, especially algae blooms during certain periods of the summer.

The river rises near the Shrewsbury/Westborough boundary and flows in a northeasterly direction, entering the 208 study area in Marlborough at the outflow from the Marlborough West sewage treatment facility. Milham Reservoir drains from the east and the Muddy Pond joins from the west. As it flows under Route 290, the river is joined by North Brook, which drains Mill Pond from the west. The river continues its northeasterly flow through Hudson. It appears brown, polluted, and neglected. Further downstream is the Hudson waste treatment facility.

Water quality of the Assabet River is poor, being dominated by the upstream treatment facilities in Westborough, Shrewsbury and the Marlborough West Plant. According to the DWPC surveys, the ample nutrient from the sewage treatment plants causes eutrophic conditions. The river has serious dissolved oxygen problems due to the aquatic plant usage of the nutrients present in the stream, causing significant diurnal fluctuation of the dissolved oxygen level. Algae blooms are evident throughout this section of the river. In the upper portion of this segment, wetlands and agricultural lands contribute non-point sources of pollution. As the river flows through the town of Hudson, coliform bacterial levels increase from sewer leaks and urban runoff. In the lower portion of this segment, a piggery is located on the banks and is the source of runoff problems associated with the farmlands.

Based on conditions experienced during the 1973 survey, the DWPC assigned this segment a U classification. Despite the poor quality, the river is used for canoeing, fish and wildlife propagation, and fishing.

Downstream of the Hudson STP, the river flows into Stow. The banks are bordered by marshland with an extensive marsh on the west bank. At the Route 62 Bridge, a factory downstream of a dam uses the river's water for power. The river is joined by Fort Meadow Brook from the south as it

follows a meandering course through Stow. Further downstream, Boon Pond drains into the river from the east.

The effluent from the Hudson treatment plant is the dominant factor in the degradation of water quality in this segment. The Gleasondale impoundment located in that upstream section, was found to be very eutrophic. At the outlet of the impoundment, there were low dissolved oxygen levels, high levels of nutrients and moderate levels of coliform bacteria. As the river flows out of the impoundment, it begins to assimilate the wasteload and begins to recover. At the end of the segment, moderate levels of nutrients and low dissolved oxygen, due to diurnal fluctuation from aquatic vegetation, were the source of water quality problems. Non-point sources are minimal in this segment of the Assabet with overland agricultural runoff a contributor of nutrients. Water quality of the Assabet in this section is classified as U although the river is still used for canoeing, recreational boating, fish and wildlife propagation, and fishing

The river now both wide and gently flowing continues its northerly course through Stow and into Maynard. The Assabet Brook drains into the river upstream of the Stow/Maynard town line. The river, as it flows through Maynard, is very shallow and rocky. This is due to the fact that much of its water has been diverted for use by the mills and factories along its banks. The river flows through a diversion channel whose dam formed the large impoundment in the center of the town. Further downstream, the river again becomes deep enough for canoeing. Near the Maynard/Acton town line, the Maynard waste treatment facility discharges into the river.

During the 1974 DWPC survey, this section of the Assabet was found to have the fewest water problems in the river. Dissolved oxygen problems were present because of aquatic vegetation activity. Coliform levels rose as the river flowed through Maynard. Urban runoff was identified as a possible source of pollution. In the upper portion of this segment, agricultural runoff contributes some nutrients. Water quality conditions generally conform to Class C standards.

The Assabet flows into Concord beyond the Maynard STP. It flows through the heavily populated areas of West Concord, past Route 2, and the sewage disposal plant of the Concord MCI. Further downstream at Egg Rock, the Assabet and Sudbury Rivers meet to form the Concord River.

Effluent from the Maynard STP severely degrades the water quality in this latter section of the Assabet. The non-chlorinated effluent produced extremely high coliform bacteria levels. High nutrient levels facilitated nitrification in the stream, which resulted in low dissolved oxygen levels. Further downstream, the discharge from the Concord MCI treatment facility also influenced water quality. Possible non-point sources of pollution were septic leachate from the heavily populated areas in West Concord and runoff from the numerous roadways that traverse the river. Near the confluence of the Assabet and Sudbury Rivers, high levels of pesticides were found in fish samples collected in this segment. Water quality in the downstream portion of the Assabet is classified as U, although the river is used for canoeing, boating, fishing, fish and wildlife propagation as well as assimilation.

In spite of the poor water quality and low-flow problems experienced in the river, the river supports a substantial fish population. In fact, the Sudbury and Assabet River Basins constitute one of the largest freshwater fisheries in the Commonwealth. This is primarily due to the many large, healthy tributaries, wetlands and ponds which are ideally suited to the propagation of a wide variety of fish in fairly large numbers. These tributaries also provide a haven for fish when conditions in the main streams become unhealthful. Large numbers of trout are stocked annually in the tributaries to both rivers.

Concord River

The Concord River begins at the confluence of the Sudbury and Assabet Rivers in Concord. The river, wide and slow-moving, flows in a northerly direction through the Great Meadows Wildlife Refuge Area. Tributaries to the river in this section include Mill and Saw Mill Brooks. The river continues its northerly flow through the meadowlands along the Concord/Bedford town line and into Carlisle, which is outside the 208 study area.

Water quality of the river is fair, suitable for recreational boating, fishing, fish and wildlife propagation, and water supply with treatment. The water quality is presently designated as Class C.

As in the Sudbury River, dissolved oxygen problems caused by meadowlands draining into the main channel were found in this section of the river. The problem occurs only during certain periods of the year but can be expected to be repeated annually. Coliform bacteria levels remained moderately high and can be attributed to meadowland runoff and individual septic systems. Nutrient levels were sufficient to support eutrophic conditions. As found in the Sudbury River, pesticides levels appear to be high in this river segment.

The major discharge into the Concord River (via Great Meadow Swamp) is the Concord municipal sewage treatment plant.

C. ON-GOING PLANNING AND IMPLEMENTATION ACTIVITIES

Presently, there are two on-going activities in the SuAsCo Basin. These are the EPA-MDC EMMA Plan-EIS and the Lake Cochituate 314 program being conducted by DEQE. The EMMA plan/EIS will effect three communities in the basin. They are Framingham, Ashland and Bedford. The EMMA program has been discussed in the Mystic, Charles and Neponset basin sections and will not be discussed again here as much the same issues affect these three communities as the other 40 located in those other basins.

The DEQE-Lake Cochituate 304 program involving a comprehensive land management program plus some innovative in-stream treatment measures to treat inflowing tributaries to the lake. The program, when completed, will serve as a useful model to other lake and lakeshed management programs in the region.

D. MAJOR BASIN ISSUES

Major issues affecting the upgrading and maintenance of water quality goals in the SuAsCo Basin can be summarized as follows:

- Given the impounded condition of the Assabet river and the continuing series of discharge-impoundment along the length of the river, will expenditures for advanced waste treatment result in improved water quality with respect to algae and dissolved oxygen problems?
- In a basin which is about half and half sewerer/non-sewerer, how can projected growth be best accommodated in the mix of available housing served by existing sewerage infrastructure?
- Communities must act jointly to protect and preserve the basin's remaining wetlands in order to allow them to perform their natural water storage-release function.
- Communities must act jointly to protect ground and surface water supplies which are shared by several communities.

ACTON: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

It is recommended that the town of Acton:

- Maintain on-lot septic systems as the town-wide wastewater management system.
- Continue to collect and treat septage at the town's septage treatment lagoons (but a higher degree of treatment may be required later).
- Continue the on-going septic system maintenance and enforcement program.
- If severe problems with on-lot septic systems are encountered in the future, consideration should be given to package plants with limited collection systems.

These recommendations are based on the public record of the effectiveness of the town's current septic system maintenance and enforcement program and on the stated preference of the town's officials and citizens to implement such a program. Further, it has not been shown that significant problems with regard to water quality and public health exist in sufficient magnitude or seriousness to warrant sewerage at this time. These recommendations should be evaluated in the town's on-going 201 Facilities Plan being developed by Anderson-Nichols and incorporated or changed to reflect more detailed local data as appropriate.

II. STORMWATER MANAGEMENT

Stormwater runoff is not considered to be a major water quality problem at this time. The town should begin planning now to prevent water quality problems due to runoff from occurring as a result of development within the town.

Acton is located entirely within the Assabet River Watershed. Street drainage is provided by numerous small collection systems which discharge to the nearest watercourse. Although not comprehensive, these systems are found at most housing developments.

In their inventory, CDM identified twelve storm drainage systems. Three of these systems discharge to tributaries of Nagog Brook. Four systems discharge to tributaries of Nashoba Brook. The remaining five systems discharge to the Fort Pond Brook system. Nagog Pond is used as a surface water supply for the town of Concord. Three water supply wells are located in the Nashoba Brook watershed.

Operation and maintenance work on the stormwater collection system is performed by the Highway Department. Catch basins which tend to become clogged are cleaned on a regular basis.

Recommendations to the town include the following:

- In addition to catch basin cleaning, a semi-annual inspection program of catch basins, outfalls and receiving streams should be developed to determine the need to develop and implement outfall and stream maintenance programs.
- In site planning for future development, maximum use should be made of natural drainage and non-structural control measures.

III. ESTIMATED COSTS

Average annual local costs are as follows:

(1) Sewerage	0	
(2) Septage Treatment	\$37,600	
(3) Stormwater	\$144,750	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

No industrial discharge problems have been identified in Acton. An industrial survey is included in the Facilities Plan under preparation.

V. NON-POINT SOURCES

A. Landfills. The town operates a sanitary landfill approved by the Mass. DEQE. It is not reported to be causing any current water quality problems. It is recommended that the town and DEQE establish a groundwater monitoring well in the vicinity of the site to ensure adequate groundwater protection.

B. Salt Storage and Application. In 1970, MDPH notified Acton and 62 other communities that drinking water supplies contained sodium above the 20 mg/l recommended limit. Road salt should be stored in a covered shed with an impervious floor if sampling reveals contamination beyond the site.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Acton should adopt wetlands zoning to deal with existing water quality problems and adopt an aquifer protection district to protect its groundwater for water supply.

The town should adopt the new HUD Flood Insurance map which is more extensive than Acton's present floodplain district.

Acton should also consider the use of cluster zoning which would serve to further protect its groundwater.

In addition, changes in zoning may be necessary because of potential conflicts with the current zoning and the land's environmental capacity to support intensive or dense development.

In the future, Acton should consider adopting a watershed protection district to maintain the water quality of any unprotected water bodies, including Nagog Pond.

VII. MANAGEMENT

The town has expressed a strong preference, at least pending completion of their ongoing 201 planning, for reliance on on-site wastewater disposal. For such an approach to be effective these systems must be constructed, operated and maintained properly. It is the town's position that it has the administrative capabilities to provide such assurances, citing the hiring of professional town officials including a Director of Health, Building Commissioner and Town Engineer, and through stricter sub-surface disposal standards, enforcement practices and septage management. Acknowledged problems with large septic systems in the community are attributed to inadequate administration of applicable regulations at the state level. Accepting this assessment, it is recommended that the Board of Health initiate a vigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping, to the reconstruction of failing systems.

In conjunction with the on-going 201 study should be a consideration of a mandatory inspection and maintenance program for the community. Such a program could take many forms (See Part II of this plan), depending upon the resources and goals of the community. The Federal Clean Water Act of 1977 allows the use of 201 construction grant monies for privately owned treatment works serving one or more principal residences or small commercial establishments. However, the public body applying for the grant, in this case the town, must meet certain requirements, including assurances that such treatment works will be properly operated and maintained and that an acceptable user charge system will be instituted to pay for operation and maintenance costs. An effective inspection and maintenance program might

therefore assist Acton in getting 201 money for the reconstruction of failing septic systems and the construction of communal septic systems.

The town planning board, in conjunction with the conservation commission and the Board of Health, should evaluate the land use recommendations made above with respect to existing land use and natural features information in the community. Particular reference should be made to the results of the Greentown project. The MAPC, through its technical assistance program, can assist Acton in developing an action program based on the information generated in the SCS Natural Resources Planning Program. Zoning changes, consistent with the preventive land control recommendations presented above and with local goals and policies, should be developed and presented for town meeting approval.

ACTON: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
 - II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
 - III. Social Impacts
 - A. Open Space and Recreation
 - B. Archaeological and Historic
 - C. Housing
 - IV. Economic Impacts
 - A. Manufacturing
-

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one concept over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of Acton. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since any other taxing mechanism could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included for each concept, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6% and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost of the wastewater treatment recommendations for Acton is \$4,900 with a resulting tax rate impact of \$0.03. The operation and maintenance cost would be \$32,700 annually.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for Acton there appear to be substantial impacts. Potential erosion problems could occur in areas of steep slope, erodible soils, or sparse vegetation.

The amount of potential erosion areas affected by the projected future growth in Acton appears to be approximately 850 acres.

Positive effects would result in those areas where the intensity of permitted development would be reduced through the land development recommendations. Potential erosion problems would be reduced in these areas, and this would be a positive effect and would be a long-term consequence.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that significant impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The adoption of the environmental wetland and floodplain districts would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

The extent of the flood control problem areas appears to be 1000 acres in Acton which is over 20% of the land undergoing substantial growth pressure.

C. Groundwater Impacts. The wastewater solutions recommended for Acton appear to have slight impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

However, some positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as an extended floodplain, and aquifer protection district, and wetland overlay districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations do constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The use of expanded or additional floodplain and wetland districts in Acton would provide a positive benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

The amount of potential wildlife habitat now existing in Acton which could be affected by projected low density growth is 4200 acres or over 30% of the town.

E. Air Quality. It is anticipated with the growth patterns projected in the recommendations, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the recommendations will have a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Acton would be moderate with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents. In a few areas in the basin, small open space parcels are adjacent to or surrounded by land zoned for industrial use. Impacts from this type of development on open space could be slightly negative, long-term, but primarily of local importance.

Scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these floodplains and wetlands, or buffer districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

It also should be noted that where the permitted residential density would be decreased according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

In several places in Acton where open space could be affected by development the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, commercial, or moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

B. Archaeological and Historic Impacts. A review of the potential impacts of the recommendations on existing archaeological and historic sites in Acton indicates that the growth pressure would create negligible impacts on only a few sites. These few sites are either zoned for moderately high residential, commercial or industrial development; or they are adjacent to such uses. Certainly when a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss of any of the archaeological or historic sites would be regional in significance.

The historic Isaac David Trail passes through several parcels of developable land in Acton. These parcels range in zoning from low residential to moderate residential and industrial. Another historic site is the Faulkner Homestead located in South Acton. It is adjacent to moderate-high residential and industrial zoned parcels. The continuation of low density scattered development could have minimal negative impact on the historic sites.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 3100 housing units anticipated for Acton means that over 2800 acres of residential land will be developed over the 20-year period. Acton appears to be capable of accommodating the expected residential demand. The town already has a number of apartment developments.

Acton allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost. This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

However, the outlined environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is necessary to determine the potential impact of these costs upon such manufacturing establishments. Because cost impacts ultimately will affect jobs, it is important to estimate what firms may be most affected by the requirement of the water quality plan. The recommendations for Acton represent little or no reliance on structural solutions to water quality problems and as a result it would seem that opportunities for employment in manufacturing would be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

Presently, Acton has ten "wet" manufacturing firms that account for about 25 percent of all that town's manufacturing employment. Six of these firms have been identified as having fewer employees than the median size for their counterparts statewide. Water-intensive employment for Acton accounts for less than 9 percent of total employment now, and is expected to remain about the same through 1995.

ASHLAND: RECOMMENDED 203 PLAN

I. WASTEWATER TREATMENT

Twenty-four percent of the population is served by a wastewater collection system which discharges ultimately to the MSD system for treatment at the Nut Island treatment plant. The town is currently in the Step 2 design phase of expanding this system to serve the Cordaville Road and the Reservoir and Elliot Street areas. Following the construction of this expansion, 37 percent of the town will be served by the sewerage system. Septage collected from the remainder of the town is discharged to the septage disposal manhole on Arthur Street in Framingham which also is ultimately treated at Nut Island.

It is recommended that the town continue to implement the recommendations of the town's facilities plan and continue to rely on the MDC for both sewage and septage disposal.

II. STORMWATER MANAGEMENT

The Department of Public Works is responsible for operation and maintenance of the stormwater collection system. Catch basin cleaning is contracted out annually. Brook and channel maintenance is done by the Department.

Recommendations to the town include:

- A study should be undertaken by the town to locate and evaluate drainage system components in the Pleasant Street - Myrtle Street - Fountain Street - Main Street areas in order to assess their potential water quality impacts.
- In planning for future development, maximum use should be made of natural drainage and non-structural control measures.

III. ESTIMATED COSTS

Average annual local cost is as follows:

(1) Sewerage	0 (none recommended beyond current
(2) Septage Treatment	0 facilities plans)
(3) Stormwater	\$73,500 (much of this cost already may appear in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Three industries in Ashland have been classified as significant. Ashland Sand & Concrete Company has been issued an NPDES permit for the discharge of treated gravel washwater to Cold Spring Brook, a tributary of the Sudbury River. Fenwal, Inc. is permitted to discharge uncontaminated cooling water to Cold Spring Brook. General Electric has been issued a permit for cooling water discharges to the Sudbury River.

Recommendations to the town include the following:

- The town should adopt a sewer use law comparable to the model sewer use law developed by MAPC and at least as stringent as the MDC sewer use law. In addition, a drain layer's manual should be adopted to regulate the installation of sewer connections.
- New industries should be required to discharge sanitary and process wastewater (with pretreatment, if required) to the sewer system. Water conservation and recycling of process wastewater should be encouraged.

V. NON-POINT SOURCES

A. Landfills. The town's Howe Street landfill is used primarily for the dumping of brush, bulk items and some refuse. Most of the town's solid waste is disposed of at the Framingham incinerator. An inspection in May of 1976 by DEQE resulted in the issuance of four violation notices. Problems cited included covering and grading practices. The facility is presently operating without approved operation or closure plans and is reaching site capacity. Orders for such plans from DEQE are likely in the near future.

It is recommended that plans for the closing and sealing of the Howe Street facility be developed by the town in the near future (by 1980) and that such plans should include provisions for surface and groundwater monitoring.

B. Salt Storage and Application. Road salt is reportedly stored without a cover. Monitoring should begin immediately and a covered shed with an impervious floor should be built if contamination is found beyond the site.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Ashland should undertake steps to protect its groundwater and water supply wells by delineating an aquifer protection district.

Ashland needs to reduce the density permitted in a few areas which is incompatible with the land's environmental capability.

A stream buffer district would protect streams not currently protected.

In the future, Ashland should consider additional protection of its water resources by extending its wetlands zoning or by reviewing the uses permitted in the district, and/or by extending its floodplain district to avoid potential problems. Other future options include making more extensive use of clustering.

VII. MANAGEMENT

Ashland is an MSD-member community , and is expanding its system with federal funds, and therefore will be required to undertake some management activities in order to comply with federal and state requirements. Because the community is connected to the MSD, it will be required to implement and maintain a user charge and industrial cost recovery billing and collection system which must be approved by the MDC and EPA. Additionally, once MDC promulgates presently proposed rules and regulations covering discharge of sewage, drainage, substances or wastes to the MSD system, communities will be required to have in effect a sewer use bylaw or ordinance no less stringent than the regulations of the MDC. These requirements will place significant administrative and management burdens on Ashland. Reference should be made by Ashland to the model sewer use ordinance and drain layer's manual presented in this plan. Compliance with these MDC requirements will generally be sufficient to comply with EPA user charge and industrial cost recovery, and sewer use ordinance requirements.

The Board of Health currently requires that malfunctioning septic systems connect to a public sewer, if one is available. The Board of Health should monitor the Howe Street landfill to insure that state landfill regulations are being complied with.

Town meeting should be asked to appropriate funds for the construction of a proper salt storage facility. Available state funds (from the DPW) should be sought.

The town planning board, in conjunction with the conservation commission, should evaluate the land use recommendations with respect to existing land use and natural features information in the community. The MAPC can provide some preliminary data and technical assistance in this effort. Zoning changes, consistent with the preventive land control recommendations presented above and with local goals and policies, should be developed and presented for town meeting approval.

The development of an aquifer protection district should be based on a hydrologic study delineating the aquifer. Town meeting should be asked to approve funds for such a study.

ASHLAND: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
- II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
- III. Social Impacts
 - A. Open Space & Recreation
 - B. Archaeological & Historic
 - C. Housing
- IV. Economic Impacts
 - A. Manufacturing

I. DIRECT COST IMPACTS

There would be no direct costs associated with recommendations for Ashland, except those associated with stormwater management, which are already largely in local budgets.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion for Ashland there appear to be both positive and negative impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation if these areas are developed.

Different effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long term consequences.

The amount of potential erosion areas affected by future growth in Ashland appears to be approximately 350 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of the anticipated future growth in terms of potential flood control problems, it appears that moderate impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas and steep slope areas.

The extension of wetland and floodplain districts would have a positive effect on flood control problems. These regulations would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulations remained in effect.

The extent of the flood control problem areas appears to be about 350 acres in Ashland. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The growth projected to occur in Ashland appear to have slight impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Some positive effects on groundwater could accrue in areas where groundwater favorability coincides with recommended extension of environmental zoning districts, such as floodplain and wetland overlay districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean clustering of lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning. For the community to fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future growth constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low and moderately low density type of development which has been occurring up to now means that urban development is dispersed across the community.

One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitat.

The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The extended use of floodplain and wetland districts in Ashland would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

E. Air Quality Impact. It is anticipated with the growth patterns projected as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. Therefore, impacts on air quality would be negligible.

III. SOCIAL IMPACTS

A. Open Space & Recreation Impacts. Generally, impacts on public and semi-public lands in Ashland would be minimal with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderately low residential. Development of this density could result in more use of existing open space and recreation areas by the residents.

In Ashland several scattered public and semi-public lands fall within existing and recommended environmental zoning overlay districts. The additional development constraints contained in these floodplains, wetlands, or aquifer protection districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

In several places in Ashland where open space could be affected by development the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, commercial, or moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological & Historic Impacts. A review of the potential impacts on existing archaeological sites in Ashland indicates that the growth pressure would create negative impacts on only a few sites. These few sites are either zoned for residential, industrial development; or they are adjacent to such uses. Certainly when a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss of any of the archaeological or historic sites would be regional in significance.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 1000 housing units anticipated for Ashland means that about 840 acres of residential land will be developed over the 20-year period.

Ashland allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the outlined environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development.

The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV ECONOMIC IMPACTS

A. Manufacturing. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is important to determine the potential impact of these costs upon such manufacturing establishments. Because cost impacts ultimately will affect jobs, it is important to estimate how manufacturing would be affected by the requirement of the water quality plan.

The recommendations for Ashland represent reliance on non-structural solutions to water quality problems and as a result it would seem that opportunities for employment in manufacturing could be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

Ashland has about 250 jobs in water-intensive employment, which is expected to decrease to about 115 by 1995. As a percentage of total employment, this is 6 percent in 1975 and about 1 per cent in 1995.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

BEDFORD: RECOMMENDED 203 PLAN

I. WASTEWATER TREATMENT

The existing sewer system serves about 47 percent of the town's population. Wastewater is discharged to the MSD for treatment at Deer Island. The town is currently in the process of expanding its sewerage system to serve the entire town. Sewer construction is completed in West Bedford. Step 2 design of the sewerage system to serve the remainder of the town has been completed. An application for a Step 3 construction grant was filed but was not awarded. Due to capacity problems in the Bedford-Lexington trunk line to the MDC (which resulted in severe overflows in 1977) it is likely that a sewer moratorium will remain in effect in Bedford until the completion of the MDC's proposed Mill Brook Valley Relief Sewer which is presently in the Step 1 facilities planning stage. The town is in the process of eliminating sources of inflow (i.e., sump pumps) to the system. Following the completion of the Sewer System Evaluation Survey presently underway, the town will initiate the Rehabilitation Program.

It is recommended that the town undertake whatever measures are required to control and/or eliminate sources of inflow/infiltration to the sewerage system. A sewer construction moratorium should be enforced until such time as either adequate capacity in the existing Bedford-Lexington line becomes available due to both towns elimination of infiltration/inflow sources, or the completion of the MDC Mill Brook Valley Relief Sewer.

Septage collected from the unsewered portions of the town is hauled to Burlington for discharge to the MDC system. It is recommended that this be allowed to continue until the town's sewerage program is completed.

II. STORMWATER MANAGEMENT

Operation and maintenance of the stormwater collection system is performed by the Department of Public Works. Catch basins and drain pipes are cleaned on a regular basis.

Recommendations to the town include the following:

- A town-wide drainage survey should be made within the town due to the topography.
- Brooks and outfalls should be inspected on a regular basis and cleaned if necessary.
- In planning for future development, maximum use should be made of natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

Average annual local costs is as follows:

(1) Sewerage	0	
(2) Septage Treatment	0	
(3) Stormwater	\$147,850	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Two industries in Bedford have been identified as significant dischargers. The Raytheon Company and the Millipore Corporation have NPDES permit applications pending issuance for discharges to Elm Brook and Vine Brook, respectively. The Raytheon Company discharges consist of process and cooling wastewaters. The Millipore Corporation discharge consists of uncontaminated cooling water.

Recommendations to the town include the following:

- The town should adopt a sewer use law comparable to the model sewer use law developed by MAPC and at least as stringent as the MDC sewer use law. A drain layer's manual should also be adopted to regulate the installation of sewer connections.
- New industries should be required to discharge sanitary and process wastewater (with pretreatment, if required) to the sewer system.
- Industries should be encouraged to practice water conservation and to recycle their process wastewater.

V. NON-POINT SOURCES

A. Landfills. The town disposed of its solid waste at a landfill off Carlisle Road adjacent to the Concord River. The site was closed to refuse dumping by the state in 1968 and is used presently for only brush and clean fill. The town contracts for collection and disposal of solid waste at a private landfill in Tyngsboro. This site has not been shown to be a major water quality problem at this time.

It is recommended that the former landfill site be monitored to prevent any further water quality problems.

B. Salt Storage and Application. Analysis of Bedford water supply well samples shows several wells exceeding the allowable sodium concentrations of 20 mg/l with concomitant high chloride concentrations. Although it is difficult to pinpoint the source, it is likely that a substantial contribution is made from road deicing salt runoff. It is recommended that the town develop and implement a salt use program sensitive to critical water resource areas (particularly aquifer recharge areas).

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application and procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Bedford should adopt wetlands zoning to deal with identified existing water quality problems.

The town should delineate an aquifer protection district to protect areas of high groundwater favorability and water supply wells and also delineate a stream buffer district to protect its streams.

In the future, Bedford should consider extending its floodplain district to avoid potential water quality problems.

In addition, the town should consider clustering as a technique to minimize groundwater and recharge problems and to provide an alternative pattern of development.

VII. MANAGEMENT

In order to effectively address the control and elimination of sources of inflow (such as sump pumps). Bedford should have a sewer use ordinance which specifically addresses the problem.

Because the community is connected to the MSD, it will be required to implement and maintain a user charge and industrial cost recovery billing and collection system which must be approved by the MDC and EPA. Additionally, once MDC promulgates presently proposed rules and regulations covering discharge of sewage, drainage, substances of wastes to the MSD system, communities will be required to have in effect a sewer use by-law or ordinance no less stringent than the regulations of the MDC. These proposed regulations prohibit the introduction of ground, storm, surface or unpolluted waters into the sanitary sewers. These requirements will place significant administrative and management burdens on Bedford. Reference should be made by Bedford to the model sewer use ordinance and drain layer's manual presented in this plan.

The Bedford Planning Board, working with the Conservation Commission should consider the land use recommendations made above. Land use and natural features information which is more detailed than the MAPC information should, of course, be referred to. A more detailed delineation of the aquifer recharge area in the community would be desirable, and town meeting should be asked to authorize such a study. Zoning changes, consistent with the preventive land control recommendations presented above, and with local goals and policies, should be developed and presented for town meeting approval.

BEDFORD: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
 - II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
 - III. Social Impacts
 - A. Open Space and Recreation
 - B. Archaeological and Historic
 - C. Housing
 - IV. Economic Impacts
 - A. Manufacturing
-

I. DIRECT COST IMPACTS

There would be no direct costs associated with recommendations for Bedford except those associated with stormwater management which already are largely in local budgets.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible affects on erosion there appear to be slight impacts with only 25 acres considered to be erosion prone if developed. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effects.

B. Flood Control Impacts. When assessing the potential effects of future growth in terms of potential flood control problems, it appears that significant impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extended use of a wetland/floodplain district would have a positive effect on flood control problems. These regulations would serve to reduce or prohibit development in significant areas which have potential flood

control problems. This benefit would continue as long as the regulations remained in effect.

The extent of the flood control problem areas appears to be 240 acres in Bedford. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. Future development anticipated to occur in Bedford appears to have minimal impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

However, some positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as floodplain and wetland overlay districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat constitute about half of the amount of acreage in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low to moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The extended use of floodplain and wetland districts in Bedford would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulations are in effect.

E. Air Quality Impacts. It is anticipated with the growth patterns projected, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. Therefore, impacts on air quality would be negligible.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Bedford would be slight with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents.

In Bedford, several scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these floodplains or wetlands protection districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

B. Archaeological and Historic Impacts. A review of the potential impacts of the recommendations on existing archaeological and historic sites in Bedford indicates that the growth pressure would create negative impacts on a few sites. These few sites are either zoned for low to medium residential, commercial or industrial development; or they are adjacent to such uses. Certainly when a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss of any of the archaeological or historic sites would be regional in significance.

In addition to the future growth pressure on archaeological sites, the recommendations indicate potential positive impact on a few of the sites. These sites are located within environmental zoning districts, such as wetlands and floodplain overlay districts. The provisions of these districts act as development constraints, thus giving additional protection to the archaeological sites.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 630 housing units anticipated for Bedford means that 700 acres of residential land will be developed over the 20-year period.

Bedford allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost. This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects

may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the outlined environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

These factors would combine to affect a considerable amount of land, and this could reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle income families may become more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is important to consider the potential impact of these costs upon such manufacturing establishments. The recommendations for Bedford represent reliance on non-structural solutions to water quality problems and as a result it would seem that opportunities for employment in manufacturing could be reduced. There may be some cases in which some opportunities may be foreclosed because of the development constraints imposed by overlay zoning districts such as wetlands and flood-plain zoning.

Bedford has about 770 jobs in water-intensive employment which is expected to decrease to about 415 jobs by 1995. As a percentage of total employment in 1975 this is about 10 percent and in 1995 about 6 percent.

As a 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

CONCORD: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

The town's existing sewerage system serves about 32 percent of the present population. The town owns and operates a secondary wastewater treatment facility which discharges to the Great Meadows Wildlife Refuge adjacent to the Concord River. The town has recently completed a major capital improvements program at the facility to correct problems which had plagued the facility for some time. These included reconstruction of the nine sand filter beds and underdrain systems and removal of the septage disposal pits.

Under an agreement with the Fish and Wildlife Service, the town discharges the effluent from its secondary treatment facility to the Great Meadows Wildlife Refuge. The agreement states that if the Fish and Wildlife Service determines the discharge is harmful to the refuge, the Department of the Interior can require the town to move the discharge from the refuge.

The Fish and Wildlife Service has determined that the discharge of effluent to the Great Meadows Wildlife Refuge is harmful. Their judgement is based on EPA's field survey carried out in October, 1976, which established that the Concord effluent was adding 560 pounds of nitrogen and 153 pounds of phosphorous per acre annually. According to Fish and Wildlife Service the fertilizer applications used for normal fish cultural operation seldom exceed 200 pounds of nitrogen and 200 pounds of phosphorus per acre/year. Therefore, the elimination of effluent is considered essential to reduce the input of nutrients into the swamp. These nutrients accelerate the growth of algae and weeds which in turn force out plant life that is beneficial for wildlife. The Fish and Wildlife Service has therefore asked the town to extend the outfall to the Concord River. EPA agrees that this would be consistent with the overall water quality objectives. The Concord Treatment Plant will eventually have to meet load allocations developed by the Division of Water Pollution Control and approved by EPA. In the interim, EPA would allow a discharge into the Concord during the construction of needed improvements to the existing treatment facility.

As the EPA field survey was undertaken prior to the completion of the sand bed reconstruction and as data collected at the discharge as well as on the Concord River above and below the refuge demonstrates the ability and utility of the wetlands to renovate the effluent, mitigating its potential impact on the river; 208 staff does not feel that there is adequate demonstration that the discharge is harmful to the refuge. MAPC recommends that EPA, DWPC, Fish and Wildlife Service and the Town of Concord initiate and participate in an Environmental Impact Statement whose purpose would be to evaluate the impacts of leaving the discharge to the refuge or modifying the type of effluent discharge system (single pipe vs. multi-port diffusers, effluent dispersion system, spray irrigation, etc.) and the costs and impacts of the additional levels of treatment required should the discharge go directly to the Concord River and the impacts of other land application alternatives not associated with the refuge. (Study is recommended to be funded by EPA).

It is recommended that the town, in its Facilities Plan, should evaluate with the consultant for the town of Maynard, the feasibility of combining the secondary effluent of both treatment plants at one or the other to accomplish advanced waste treatment, if necessary.

It is recommended that the town provide adequate septage treatment and disposal facilities for septage at the wastewater treatment plant.

No expansion of the existing sewerage system beyond those recommended in the town's facilities plan are recommended, consistent with stated town goals and objectives.

Sludge disposal is accomplished via sand bed dewatering followed by landfilling. It is recommended that this practice be continued.

II. STORMWATER MANAGEMENT

The Highway Department performs operation and maintenance work on the stormwater collection system. Catch basins are cleaned yearly, with emphasis on business areas.

Recommendations to the town include the following:

- Improvements to the stormwater systems to prevent flooding should also consider improvements to and protection of water quality.
- Outfalls and receiving streams should be inspected on a semi-annual basis and cleaned if necessary.
- In planning for future development, maximum use should be made of natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

Average annual local costs are as follows:

(1) Sewerage	0	(no sewer extensions beyond facilities plan)
(2) Septage Treatment	\$28,300	
(3) Stormwater	\$155,100	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

No significant industries were identified in Concord.

Recommendations to the town include the following:

- The town should adopt a sewer use law comparable to the model sewer use law developed by MAPC. A drain layer's manual should also be adopted to provide consistency during the installation of sewer connections.
- New industries should be required to discharge sanitary and process wastewater (with pretreatment, if required) to the sewer system.
- Industries should be encouraged to practice water conservation and to recycle their process wastewater.

V. NON-POINT SOURCES

A. Landfills. No problems with the town landfill were identified. Sampling of nearby groundwater should be instituted to rule out leachate contamination.

B. Salt Storage and Application. Neither chloride nor sodium concentrations in Concord's water supply are high enough to be cause for concern. However, in order to protect the continued viability of that supply, the town should institute a program of reducing salt use for snow and ice control.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

C. Agricultural Runoff. Although recognized as a potential local problem, agricultural runoff was not identified as an areawide problem and was not evaluated in the 208 program.

It is recommended that the town seek to apply appropriate runoff and/or land use controls to the greatest extent feasible.

VI. PREVENTIVE LAND USE CONTROLS

Concord's land use controls and use of natural resource districts are generally adequate to protect its water resources. In the future, though, this community should consider extending its wetlands district, adopting an aquifer protection district to further protect its groundwater, and/or delineating a watershed protection district to maintain the water quality of unprotected ponds and lakes. Concord may also consider extending its use of cluster zoning. The town should rezone in areas where the permitted uses would be incompatible with the land's environmental capability.

VII. MANAGEMENT

Although Concord town meeting recently authorized the town treasurer to borrow \$100,000 to extend the sewage treatment plant outfall to the Concord River it is recommended that more information be generated in the impacts of alternative effluent discharge systems. The EPA, DWPC, the Fish and Wildlife Service (Dept. of Interior) and the town of Concord should jointly enter into a memorandum of agreement for joint participation in the preparation of an Environmental Impact Statement (funded and directed by EPA) to determine these impacts. The municipal wastewater facilities are administered by the Concord Department of Public Works.

It is also recommended that Concord consider revising its current sewer use ordinance, adopted in 1969, consistent with the model sewer use ordinance and drain layer's manual presented in this plan. Any 201 funded work would also require revisions of current user charge systems to be in compliance with federal construction grant requirements.

The Concord Board of Health should initiate a vigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, wetting guidelines for the proper maintenance of septic systems and mainline use guidelines to homeowners should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems, to requiring that such systems connect to public sewers where they are accessible.

The Concord Planning Board and the Natural Resources Commission should evaluate the land use recommendations with respect to existing land use and natural features information in the community. The MAPC can provide some preliminary data and technical assistance in this effort and can supply model by-law recommendations. Zoning changes, consistent with preventive land control recommendations presented above and with local goals and policies, should be developed and presented for town meeting approval. A more detailed delineation of the aquifer recharge area in Concord would be helpful in developing controls to protect town groundwater resources. Town meeting should be asked to authorize such a study.

CONCORD: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space & Recreation
- B. Archaeological & Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of Concord. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6% and is the figure discussed in Part II, Section 2.

The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost would be \$3,700 for Concord, (not including storm-water costs), and this would result in an annual impact on the local tax rate of \$0.02. The annual operation and maintenance cost would be \$24,600.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for Concord there appear to be slightly positive impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

Different effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

The amount of potential erosion areas affected by the recommendations in Concord appears to be approximately 50 acres.

Any 201 facilities planning studies done should analyze in detail and potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that slightly positive impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extended use of environmental overlay districts would have a positive effect on flood control problems. These regulations would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulations remained in effect.

The extent of the flood control problem areas appears to be 75 acres in Concord. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for Concord appear to have slightly positive impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

These effects on groundwater could accrue in areas where groundwater favorability coincides with recommended extension of environmental zoning districts, such as aquifer and wetland protection districts. Because these

environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean more use of clustering and lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability or recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future growth in Concord constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low and moderately low-density type of development which has been occurring up to now means that urban development is dispersed across the community.

One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitat.

The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The extended use of wetland districts in Concord would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

E. Air Quality Impact. Impacts on air quality would be negligible with future development as a continuation of existing trends.

III. SOCIAL IMPACTS

A. Open Space & Recreation Impacts. Generally, impacts on public and semi-public lands in Concord would be slight with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderately low residential. Development of this density could result in more use of existing open space and recreation areas by the residents.

In Concord several scattered public and semi-public lands fall within recommended extensions of environmental zoning overlay districts. The additional development constraints contained in these wetlands or watershed protection districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

In a few places in Concord where open space could be affected by development the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, commercial, or moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological & Historic Impacts. A review of the potential impacts on existing archaeological and historic sites in Concord indicates that the growth pressure would create negative impacts on several sites. These sites are either zoned for moderately low to medium density development, or they are adjacent to such uses. Certainly when a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss of any of the archaeological or historic sites would be regional in significance.

In addition to the future growth pressure on archaeological sites, the recommendations indicates potential positive impact on some of the sites. These are located within environmental zoning districts, such as the wetlands district. The provisions of these districts act as development constraints, thus giving additional protection to the archaeological sites.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological on historic sites and should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in the recommendations in terms of the amount of land available in the community. The projected 2350 housing units anticipated for Concord means that 3050 acres of residential land will be developed over the 20-year period.

Concord allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of the land available for development would serve to intensify this pressure.

The land development recommendations for zoning density changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is important to determine the potential impact of these costs upon such manufacturing establishments.

The recommendations for Concord represent reliance on non-structural solutions to water quality problems and as a result it would seem that opportunities for employment in manufacturing would be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

Concord has about 190 jobs in water-intensive employment which is expected to decrease to about 120 jobs by 1995. As a percentage of total employment in 1975 this is about 9 percent and about one percent in 1995.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

FRAMINGHAM: RECOMMENDED 2008 PLAN

I. WASTEWATER TREATMENT

About 85 percent of the town is served by a sewerage system which discharges to the MSD system for treatment at Nut Island. There are three pumping stations in the Framingham system with bypasses to the Sudbury River which, according to the town, have never been used. A state imposed moratorium on sewer construction is in effect in the town due to capacity problems in the MSD Wellesley-Framingham Interceptor. Under this moratorium, the town is required to remove 2 parts I/I for every one part of the wastewater estimated to be generated by a new connection. At present, the town does not have a facilities plan. Septage collected from the unsewered portions of the community is discharged via the Arthur Street manhole to the Framingham system and thus to the MDC for treatment and disposal.

It is recommended that the town make application to EPA and DWPC for a Step I Facilities Plan grant to perform an Infiltration/Inflow (I/I) Study, to evaluate the capacity of the existing system in light of required capacities for future connections which might be made when capacity problems in the Wellesley-Framingham MSD Interceptor are connected and to evaluate alternative means to eliminate and/or control bypasses at the town's pumping stations.

It is recommended that the town continue its present method of septage disposal.

II. STORMWATER MANAGEMENT

The Department of Public Works performs operation and maintenance on the stormwater collection system. Catch basins are cleaned on a continual basis, but the entire system may take two or three years. Drains are cleaned when needed and broken drains are replaced.

Recommendations to the town include the following:

- The town should evaluate its current catch basin cleaning activities to determine priority areas within the town which should be cleaned at least annually. Also, as coverage is incomplete on an annual basis, a combined program of street sweeping and catch basin cleaning should be developed and implemented.
- A program of brook and channel maintenance should be developed and implemented.
- Outfalls should be inspected annually and cleaned as necessary.
- In planning for future development, maximum use should be made of the existing system where possible on natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

Average annual local cost is as follows:

(1) Sewerage	0	
(2) Septage Treatment	0	
(3) Stormwater	\$344,000	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Three industries in Framingham have been classified as significant. Dennison Manufacturing Company and General Motors have been issued NPDES permits for cooling water discharges to Beaver Dam Brook. Sealtest Foods has a permit application for a discharge to the Sudbury River.

Recommendations to the town include the following:

- The town should adopt a sewer use law comparable to the model sewer use law developed by MAPC and at least as stringent as the MDC sewer use law. A drain layer's manual should also be adopted to regulate the installation of sewer connections.
- New industries should be required to discharge sanitary and process wastewater (with pretreatment, if required) to the sewer system.
- Water conservation and recycling of process wastewater should be encouraged.

V. NON-POINT SOURCES

A. Landfills. The town operates an incinerator ash landfill in the western part of town. It is estimated that there are between 5 and 11 years of life at this site. Plans for continued operation and ultimate closure are now in preparation. Due to the potential for degradation at Sudbury Reservoir #3 by leachate from this landfill, it is recommended that a surface water monitoring program be undertaken as an aid to developing a permanent protection plan for both the continued operation and final closure of this site.

B. Salt Storage and Application. It is recommended that the town provide a suitable protected salt storage facility and that the town develop a salt application program (together with MDPW, MDC and Mass. Turnpike Authority) to protect the town's wells and the MDC reservoirs from contamination. Salt should be stored in a covered shed with an impervious floor if sampling reveals contamination beyond the storage site.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Framingham's land use controls and natural resource districts are presently adequate in protecting its water resources. However, in the future, this community should consider extending its wetlands delineation in order to avoid potential water quality problems.

Additional environmental controls to be considered would be in the form of a watershed protection district to maintain the water quality of any unprotected ponds and lakes and an aquifer protection district to maintain the recharge function in areas of high groundwater favorability.

VII. MANAGEMENT

Town meeting should authorize the initiation of a 201 facilities plan to perform an I/I study. There are no other major wastewater management recommendations for Framingham. However, because the community is connected to the MSD, the community will be required to implement and maintain a user charge and industrial cost recovery billing and collection system which must be approved by the MDC and EPA. Additionally, once MDC promulgates presently proposed rules and regulations covering discharge of sewage, drainage, substances or wastes to the MSD system, communities will be required to have in effect a sewer use by-law or ordinance no less stringent than the regulations of the MDC. These requirements will place significant administrative and management burdens on Framingham. Reference should be made by Framingham to the model sewer use ordinance and drain layer's manual presented in this plan.

The Board of Health, Conservation Commission and DPW should request funds and jointly sponsor, with the MDC, a surface water monitoring program to determine the water quality impacts of the incinerator ash landfill. The Board of Health should monitor the operation and closing of this facility for compliance with state regulations.

The town planning board, in conjunction with the conservation commission, should evaluate the land use recommendations with respect to existing land use and natural features information in the community. The MAPC can provide some preliminary data and technical assistance in this effort. Zoning changes, consistent with the preventive land control recommendations presented above and with local goals and policies, should be developed and presented for town meeting approval.

FRAMINGHAM: IMPACT ASSESSMENT

Categories

- I. Direct Cost Impacts
- II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
- III. Social Impacts
 - A. Open Space & Recreation
 - B. Archaeological & Historic
 - C. Housing
- IV. Economic Impacts
 - A. Manufacturing

I. DIRECT COST IMPACTS

There would be no direct costs associated with recommendations for Framingham, except those associated with stormwater management which already are largely in local budgets.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion for Framingham, there appear to be significant negative impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

Different effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

The amount of potential erosion areas affected negatively in Framingham appears to be approximately 650 acres and areas that would have a reduction in potential erosion problems amount to about 90 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effects.

B. Flood Control Impacts. When assessing the potential affects of future growth in Framingham in terms of potential flood control problems, it appears that significant negative impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extension of the wetlands district as recommended would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

The extent of the flood control problem areas appears to be 770 acres in Framingham. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. Future development anticipated to occur in Framingham would have slightly negative impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

However, some positive effects on groundwater could accrue in areas where groundwater favorability coincides with the extended use of environmental zoning districts, such as aquifer protection and wetlands districts. Because these environmental districts impose special constraints on development, they also function as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat constitute a moderate amount of the acreage in the town. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact of wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The use of the wetlands district in Framingham would provide a benefit for wildlife. The development constraints imposed by this land use regulation would provide local benefits for as long as the regulation was in effect.

The amount of potential wildlife habitat in Framingham is about 2500 acres or about 15 percent of the land area in the community.

E. Air Quality Impacts. It is anticipated with the growth patterns projected, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. Therefore, air quality impacts would be negligible.

III. SOCIAL IMPACTS

A. Open Space and Recreation. Generally, impacts on public and semi-public lands in Framingham would be slight with development according to the projected growth. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned for low to moderate density residential development. Development at this density would result in more use of existing open space and recreation areas by the residents.

In Framingham, several scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these wetlands or watershed protection districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

B. Archaeological and Historic Impacts. A review of the potential impacts on existing archaeological and historic sites in Framingham indicates that the growth pressure would create negative impacts on only a few sites. These few sites are either zoned for moderately high residential, commercial or industrial development; or they are adjacent to such uses. Certainly when a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss of any of the archaeological or historic sites would be regional in significance.

In addition to the future growth pressure on archaeological sites, the recommendations indicates potential positive impact on a few sites. These are located within environmental zoning districts, such as the wetlands district. The provisions of this district act as development constraints, thus giving additional protection to the archaeological sites.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

Framingham has 2995 jobs in water-intensive employment, which is expected to increase to about 3780 jobs by 1995. As a percentage of total employment, this is about 10 percent.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

C. Housing Impacts. There appears to be little overall difficulty in accommodating the anticipated residential growth in terms of the amount of land available in the community. The projected 5300 housing units anticipated for Framingham means that about 2800 acres of residential land will be developed over the 20-year period.

Framingham allows moderate amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in parts of this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

These factors would combine to affect a moderate amount of land, and thus somewhat reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle income families may become more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing.' Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is important to determine the potential impact of these costs upon such manufacturing establishments.

The recommendations for Framingham represents reliance on non-structural solutions to water quality problems and as a result it would seem that opportunities for employment in manufacturing would be reduced because of the development constraints imposed with the use of environmental zoning such as an aquifer protection and wetlands districts. Because manufacturing activities would be incompatible with the land's environmental capability to support this type of use, this would have implications for future expansion plans.

HOPKINTON: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

The entire town is presently utilizing on-site methods for the disposal of wastewater including septic tanks and cesspools. Septage collected from these systems is discharged to the MDC system via the Arthur Street manhole in the Framingham system. The town has noted that about 14 systems fail per year and that five areas within the town have persistent problems. Reasons for failure and problems include unsuitable soils for subsurface disposal, hardpan, bedrock, high water table, small lots with old systems and insufficient land area for new or expanded leach fields. The town does not have a current facilities plan.

It is recommended that the town continue its contract for septage disposal with MDC.

It is recommended that the town initiate a Step I Facilities Plan to evaluate alternative structural and non-structural solutions to on-site wastewater disposal problems faced by the town. This facilities plan should include the following for evaluation:

- elimination of all cesspools; to be replaced by septic tanks;
- feasibility of communal systems and mound systems in high density problem areas;
- alternative septage disposal arrangements under this evaluation, the MAPC recommends that the town investigate, in order of preference and priority, the following septage disposal alternatives:
 - A) Contracting with either Westborough or Milford for septage disposal at their wastewater treatment facilities.
 - B) Regional septage treatment alternatives with Southborough and Holliston.
 - C) Septage treatment facility to serve only the town.
- Development of sewer-based alternatives including the minimum and maximum service areas developed by MAPC with all wastewater collected under these alternatives to be discharged to the MSD.

It is also recommended that the town develop and implement a septic system inspection and maintenance program.

II. STORMWATER MANAGEMENT

The Highway Department is responsible for operation and maintenance of the stormwater collection system. Catch basin cleaning is done annually. Drains are cleaned on a regular basis and new or replacement drains are usually installed each year.

Recommendations to the town include the following:

- All discharges of wastewater to stormdrains should be eliminated as expeditiously as possible.
- A regular program of storm drain outfalls and receiving streams should be developed and maintenance performed as needed.
- In planning for future development, maximum use should be made of natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

Average annual cost is as follows:

(1) Sewerage	0	
(2) Septage Treatment	\$11,600	
(3) Stormwater	\$101,950	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

No significant industries have been identified in Hopkinton.

Recommendations to the town include the following:

- Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public water supplies.
- Industries should be encouraged to practice water conservation and to recycle their process wastewater.
- In the event that sewers are required in the future, the town should be prepared to adopt a sewer use law and drain layer's manual comparable to the models developed by MAPC.

V. NON-POINT SOURCES

A. Landfills. The town disposes of its solid waste at a privately-owned and operated landfill off Hopkinton Road on the Westborough town line. The site has been identified as a pollution problem due to leachate contamination to Picadilly Brook, Cedar Swamp and Cedar Swamp Pond. These problems were largely due to past covering and grading practices together with dumping in the wetland and the brook. The facility has been upgraded including improved cover and grading and clearing of refuse from the brook. Plans of operation were prepared by the owner and approved by DEQE.

It is recommended that the landfill be maintained by the owner in its improved condition with periodic monitoring by both the town and the owner to assess the need and manner of corrective and/or protective action.

B. Salt Storage and Application. There are presently no problems noted in regard to road salt impacts on municipal wells in the town. As a protective measure however, it is recommended that the town work with DPW to develop a salt use and application program to protect the town's water supply, aquifers and other sensitive water areas.

Salt should be stored in a covered shed with an impervious floor if monitoring reveals contamination beyond the site.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Hopkinton should adopt an aquifer protection district to protect any potential groundwater supply and wells and should consider the use of a watershed protection district to further protect the water quality of reservoirs.

Hopkinton should also employ cluster zoning to minimize groundwater problems.

In the future, the town could opt for a comprehensive water resource protection district as an alternative to the piecemeal approach of separate natural resource districts described above.

In addition, general soil problems indicate that some revisions to its zoning bylaw would help to prevent potential water quality problems.

VII. MANAGEMENT

Hopkinton Town Meeting should authorize the initiation of 201 Facilities Planning to evaluate, in detail, both non-structural and structural solutions for present and future water quality problems. This 201 study should also consider septage disposal. Management options range from intermunicipal agreements with Westborough or Milford for septage disposal at their municipal treatment facilities, intermunicipal agreements on the formation of a special district with Southborough and Holliston for the construction and operation of a regional septage treatment facility, or the construction and operation of a facility to serve only Hopkinton. Hopkinton membership in the MSD must also be evaluated in a 201 study (the addition of Hopkinton to the MSD is consistent with the EMMA study recommendations.)

The Hopkinton Board of Health should initiate vigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems. In conjunction with the 201 study, evaluation of the septagedisposal problem should be a consideration of a mandatory inspection and maintenance program for the community. Such a program could take many forms (see Part II of this plan), and should prompt consideration of a regional board of health depending upon the economies of scale, and the local political feasibility. Such a regional entity should be consistent with any proposed regional septage disposal configuration, and therefore could include Southborough and Holliston.

The Board of Health should monitor the operation of the private landfill off Hopkinton Road to insure that state landfill regulations are complied with.

The Hopkinton Planning Board, working with the Conservation Commission and the Board of Health should consider the land use recommendations made above. Land use and natural features information which is more detailed than the MAPC information should, of course, be referred to. A more detailed delineation of the aquifer recharge area in the community would be desirable, and Town Meeting should be asked to authorize such a study. Zoning changes, consistent with the preventive land control recommendations presented above, and with local goals and policies, should be developed and presented for Town Meeting approval.

HOPKINTON: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space & Recreation
- B. Archaeological & Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of Hopkinton. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since any other taxing mechanism could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond

issue amortized at 6% and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost would be \$1500 for Hopkinton, (not including stormwater costs), and this would result in an annual impact on the local tax rate of \$0.02. The annual operation and maintenance cost would be \$10,100.

II. ENVIRONMENTAL IMPACTS

A. Erosion. In examining the possible effects on erosion of future growth in Hopkinton there appear to be moderately negative impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

Different effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

The amount of potential erosion areas that would be affected in Hopkinton appears to be approximately 500 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of future growth in terms of potential flood control problems, it appears that moderately negative impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extended use of environmental districts would have a positive effect on flood control problems. These regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulations remained in effect.

More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The growth anticipated for Hopkinton appear to have slight impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

However, some positive effects on groundwater could accrue in areas where groundwater favorability coincides with recommended environmental zoning districts, such as aquifer protection districts. Because these environmental districts impose special constraints on development, they function as groundwater protection. By minimizing any construction activities

in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future growth constitute a moderate amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low to moderate density type of development which has been occurring up to now means that urban development is dispersed across the community.

One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitat.

The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The extended use of environmental zoning districts in Hopkinton would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

Approximately 11,000 acres or 61% in Hopkinton are considered to be a potential wildlife habitat.

E. Air Quality Impact. It is anticipated that the growth patterns projected as a continuation of existing trends would have a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space & Recreation Impacts. Generally, impacts on public and semi-public lands in Hopkinton would be slight with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents.

In Hopkinton, several scattered public and semi-public lands fall within existing and recommended environmental zoning overlay districts. The additional development constraints contained in these floodplains, wetlands, or watershed protection districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

In several places in Hopkinton where open space could be affected by development the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, commercial, or moderate residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological & Historic Impacts. There are two archaeological sites in Hopkinton; however, both sites have been excluded from future development. Therefore, impacts would be negligible.

It should be noted that the specific names and locations of the archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth in terms of the amount of land available in the community. The projected 500 housing units anticipated for Hopkinton means that about 450 acres of residential land will be developed over the 20-year period.

Hopkinton allows relatively significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is important to consider the potential impact of these costs upon such manufacturing establishments.

The recommendations for Hopkinton represents reliance on non-structural solutions to water quality problems and as a result it would seem that

opportunities for employment in manufacturing could be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses.

Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

Hopkinton has about 55 jobs in water-intensive employment, which is expected to increase to about 360 jobs by 1995. As a percentage of total employment in 1975, this is about 4 percent and in 1995, about 5 percent.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline and potential effect on manufacturing activities in the community.

HUDSON: RECOMMENDED 203 PLAN

I. WASTEWATER TREATMENT

About 60 percent of the town is served by the existing sewerage system. Sewage is treated at the town's secondary treatment facility located on the Assabet River near the Stow line. Average flow to the treatment plant is 1.04 mgd. In the 201 Step I Facilities Plan, prepared for the town by Whitman and Howard, expansion and upgrading of the plant to provide advanced waste treatment is recommended. Under the phased construction program recommended in the facilities plan, the town will be virtually 100 percent sewered by the year 2025. The plan for upgrading the treatment plant includes provision of septage treatment facilities. According to the town's consultant, these septage facilities are only designed to accommodate Hudson's septage load. It is anticipated that the Facilities Plan will be approved by EPA and DEQE by summer, 1978 and that Step 2 design will be initiated by Fall, 1978.

It is recommended that the town continue with its present method of sludge disposal, and that the town implement the recommendations of its facilities plan. In the interim, it is recommended that Hudson initiate a septic system maintenance and inspection program and continue to treat collected septage at the treatment plant.

II. STORMWATER MANAGEMENT

The Department of Public Works performs operation and maintenance on the stormwater collection system. Catch basins are cleaned and regular basis and drain lines are flushed as needed.

Recommendations to the town include the following:

- A study should be made by the town to determine the magnitude and extent of the stormwater collection system serving the older portions of the town, particularly, the town center.
- Outfalls and receiving streams should be inspected regularly and cleaned when necessary.
- In planning for future development, maximum use should be made of natural drainage and non-structural control measures.

III. ESTIMATED COSTS

Average annual local costs are as follows:

(1) Sewerage	0	(no costs beyond current facilities plan - community chart in Part II is in error)
(2) Septage Treatment	0	
(3) Stormwater	\$103,200	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Two industries in Hudson were classified as significant. The Hudson Light and Power Department has been issued an NPDES permit for cooling water discharges to the Assabet River. Hudson Lock, Inc. was classified as significant because of the potential for toxic discharges to the Hudson sewer system.

Recommendations to the town include the following:

- The town should adopt a sewer use law comparable to the model sewer use law developed by MAPC. In addition, the adoption of a drain layer's manual is recommended to provide consistency during construction of sewer connections.
- New industries should be required to discharge sanitary and process wastewater (with pretreatment, if required) to the sewer system.
- Water conservation and recycling programs should be encouraged.

V. NON-POINT SOURCES

A. Landfills. The town's present landfill, located on Gates Pond Road in East Berlin, has been identified as contributing leachate to the Assabet River via Hog Brook and Tripp Pond. Leachate problems are primarily caused by deficiencies in covering and grading and wetland encroachment. Although covering and grading practices have been improved, the fill is still leaching due to fill below the water table. This facility is reaching capacity and is expected to close within a few years. The town has submitted plans to DEQE for a new landfill site near the Assabet River. These plans include provision for leachate collection and treatment and groundwater monitoring.

It is recommended that the town develop closure plans for the existing town landfill and include provision for monitoring to assess the need for specialized remedial measures to properly seal the landfill.

B. Salt Storage and Application. No problems of salt contamination of water supplies were identified in Hudson. It is recommended that the town develop a sensitive salt program to protect from future potential problems.

The following program, which is recommended to all state and local highway units, may be helpful in preventing road salt pollution:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Hudson has a critical problem in maintaining an adequate water supply coupled with a limited recharge area for its wells. An aquifer protection district would help to maintain the recharge function of these areas.

Hudson should consider rezoning in areas where the current industrial or medium residential density zoning conflicts with the environmental capability of the land to support those types of uses.

In the future, additional natural resource districts and cluster zoning could be adopted to prevent any potential surface and groundwater quality problems.

VII. MANAGEMENT

As Hudson plans to upgrade its wastewater treatment facilities with federal funds compliance with federal user charge, industrial cost recovery and sewer use ordinance requirements will be necessary. Present methods of assessing residential and industrial user charges generally appear adequate (rates will, of course, have to be adjusted). Hudson's sewer use ordinance should be reviewed against the model sewer use ordinance and drain layers manual presented in this plan.

The Board of Health should initiate a vigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping, to the reconstruction of failing systems, to requiring connection to the municipal collection system when a septic system fails or becomes a nuisance.

The Board of Health should closely monitor the operation and closure of the existing landfill to insure compliance with state landfill regulations. Plans for the new landfill should be carefully reviewed to insure that the potential for water pollution is minimal, that it is not in a wetland or area subject to flooding, and that it is at least four feet to the highest groundwater elevation.

The Hudson Planning Board, working with the Conservation Commission and the Board of Health should consider the land use recommendations made above. Land use and natural features information which is more detailed than the MAPC information should, of course, be referred to. A more detailed delineation of the aquifer recharge area in the community would be desirable, and town meeting should be asked to authorize such a study. Zoning changes, consistent with the preventive land control recommendations presented above, and with local goals and policies, should be developed and presented for town meeting approval.

HUDSON: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
- II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
- III. Social Impacts
 - A. Open Space & Recreation
 - B. Archaeological & Historic
 - C. Housing
- IV. Economic Impacts
 - A. Manufacturing

I. DIRECT COST IMPACTS

There would be no direct costs associated with recommendations for Hudson, except those associated with stormwater management which already may be largely in current local budgets.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion for Hudson there appear to be moderately negative impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

Different effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of future growth in terms of potential flood control problems, it appears that moderately negative impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extended use of environmental districts would have a positive effect on flood control problems. These regulations would serve to reduce or prohibit development in areas which have potential flood control problems. This benefit would continue as long as the regulations remained in effect.

More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The land use controls recommended for Hudson appear to have positive impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Positive effects on groundwater could accrue in areas where groundwater favorability would be protected through the use of an aquifer protection district, because this regulation imposes constraints on development. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the district remains in effect.

Another potentially positive impact would result from the implementation of other recommended land management controls. Revised land use controls would mean clustering or lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations constitute a moderate amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low to moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of these areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The use of environmental zoning districts in Hudson would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect. Approximately 1400 acres or 18 percent of the total acreage in Hudson provide a potential wildlife habitat.

E. Air Quality Impacts. It is anticipated that the growth patterns projected, as a continuation of existing trends, would have a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Hudson would be slight with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents. In a few areas in the town, small open space parcels are adjacent to or surrounded by land zoned for commercial or industrial use. Impacts from this type of development on open space could be slightly negative, long-term, but primarily of local importance.

In Hudson, a few scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

In a few places in Hudson where open space could be affected by development, the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, commercial, or moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased according to the land development control recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. A review of the potential impacts of the recommendations on existing sites in Hudson indicates that the growth pressure could create a negative impact on one historic site, the Goodale Homestead. This site is surrounded by land zoned for moderately low residential density and for industrial. The impacts from the industrial development could be negative, of long term duration, and regional in significance.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There seems to be little overall difficulty in accommodating the anticipated residential growth in terms of the amount of land available in the community. The projected 1640 housing units anticipated

for Hudson means that about 1160 acres of residential land will be developed over the 20-year period.

Hudson allows moderate amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, low density residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the recommended environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs,

These factors would combine to affect a moderate amount of land, and somewhat reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle income families may become more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. The process of cleaning up area waterways and water bodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is important to consider the potential impact of these costs upon such manufacturing establishments.

The recommendations for Hudson represent reliance on non-structural solutions to water quality problems and as a result it would seem that opportunities for employment in manufacturing could be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

Hudson has 1090 jobs in water-intensive employment, which is expected to decrease to 705 jobs by 1995. As a percentage of total employment in 1975, this is 24 percent and in 1995, 13 percent.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

LITTLETON: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

The entire town is served by on-site systems of wastewater disposal. A privately-owned treatment facility is operated by the Very Fine Vinegar Works. A year-long monitoring program conducted by the Habitat Institute in 1974-1975 revealed that Long Lake was undergoing cultural eutrophication due to septic systems and runoff serving the residential developments within the lakeshed. Similar problems might be expected to occur following the development of areas around Forge Pond. Areas of the town with either hardpan or wet soils have been subject to intermittent failures of septic systems. Littleton Corner, Mill Pond, and Great Road were examples of such areas.

Septage collected from septic systems in the town is disposed of via "land application and/or land burial" on a private farm on Ayer Road. A second site, also a private farm, on Great Road has not be used for the past year as septage was reportedly left uncovered near a brook causing odor as well as water pollution problems. It is recommended that:

- The town continue to rely on on-site systems for wastewater disposal
- The town should initiate a Step 1 Facilities Plan to evaluate the more appropriate and cost-effective method of septage disposal including:
 - a) developing sites (including existing sites) as approvable land application sites
 - b) regional septage disposal alternatives with the town of Acton
 - c) contracting with an existing municipal wastewater treatment facility for septage disposal.
- The town should develop and implement a program of septic system maintenance and inspection.

II. STORMWATER MANAGEMENT

The Highway Department is responsible for operation and maintenance of the stormwater collection system. Catch basin cleaning is done annually by a contractor. Recommendations to the town include the following:

- The town should consider undertaking a town-wide drainage study to determine drainage needs.
- In planning for future development, maximum use should be made of natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

Average annual local costs are as follows:

- | | | |
|-----------------------|----------|---|
| (1) Sewerage | 0 | |
| (2) Septage Treatment | \$15,100 | |
| (3) Stormwater | 91,500 | (much of this cost already may be in local budgets) |

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Three industries in Littleton were classified as significant. New England Apple Products, Hyletronics Corp., and Warren Communications have NPDES permit applications on file and pending issuance. New England Apple Products discharges to Mill Brook and the other two industries discharge to Fort Pond. Recommendations to the town include the following:

- Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public water supplies.
- Water conservation and recycling programs should be encouraged.
- If sewers become necessary in the future, the town should be prepared to adopt a sewer use law and drain layer's manual comparable to the models developed by MAPC. If Littleton participates in a regional sewerage district, the sewer use law should be at least as stringent as the district's sewer use law.

V. NON-POINT SOURCES

A. Landfills. The town's current landfill site at Spectacle Road is operating under DEQE approved plans of operation and is expected to continue operating for approximately seven years.

It is recommended that when capacity of the existing site is reached, the facility should be carefully closed and sealed in accordance with state regulations. Also, monitoring it before and after closing is recommended.

B. Salt Storage and Application. Littleton is currently on the Commission of Public Health's warning list of communities whose public water supply contains over 20 mg/l of sodium. As Littleton depends entirely on local groundwater for its water supply, it is recommended that the town, together with MDPW, develop a strategic salt application program.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks

with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).

- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

The town should consider zoning changes including cluster zoning to deal with general soil problems. In the future, Littleton should consider extending its wetlands/floodplains district and consider adopting a separate aquifer protection district since there is industrially-zoned land located near town wells and other sources of the town's water supply.

Also for future consideration would be a watershed protection district in order to maintain the water quality of unprotected ponds and lakes including Nagog Pond.

VII. MANAGEMENT

As the wastewater treatment recommendation for the town of Littleton is to continue to rely on on-site wastewater disposal systems it is crucial that such systems are located, constructed, operated and maintained properly. The Littleton Board of Health has the advantage of membership in the Nashoba associated Boards of Health which increases its administrative capabilities in processing on-site sewage disposal construction permits. Industrial wastes are specifically dealt with.

The Board of Health working with the Nashoba Health District should initiate a vigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping, to the reconstruction of failing systems.

In conjunction with the proposed 201 study evaluation of the septage disposal problem should be a consideration of a mandatory inspection and maintenance program for the community. Such a program could take many forms (See part II of this plan), depending upon the resources and goals of the community. The Federal Clean Water Act of 1977 allows the use 201 of construction grant monies for privately owned treatment works serving one or more principal residences or small commercial establishments. However, the public body applying for the grant, in this case the town, must meet certain requirements; including assurances that such treatment works will be properly operated and maintained and that an acceptable use charge system will be instituted to pay for operation and maintenance costs. An effective inspection and maintenance program might therefore assist Littleton in getting

201 money for a septage disposal solution, and perhaps for the reconstruction of failing septic systems and the construction of commercial septic systems.

The Board of Health should closely monitor the town landfill to assure compliance with DEQE regulations and approved plans.

The town planning board, in conjunction with the conservation commission, should evaluate the land use recommendations made above with respect to existing land use and the board of health and natural features information in the community. The MAPC can provide some preliminary data and technical assistance in this effort. Zoning changes, consistent with preventive land control recommendations presented above and with local goals and policies, should be developed and presented for town meeting approval. A more detailed delineation of the aquifer recharge area in Littleton would be helpful in developing controls to protect town groundwater resources. Town meeting should be asked to authorize such a study.

LITTLETON: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
 - II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
 - III. Social Impacts
 - A. Open Space and Recreation
 - B. Archaeological and Historic
 - C. Housing
 - IV. Economic Impacts
 - A. Manufacturing
-

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of Littleton. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6% and is the figure discussed in Part II, Section 2. The "tax rate impact" shows

the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost would be \$2,000 for Littleton (not including storm-water costs), and this would result in an annual impact on the local tax rate of \$0.04. The annual operation and maintenance cost would be \$13,000.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion from anticipated future development in Littleton, there appears to be moderately negative impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

Different effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of the projected growth in terms of potential flood control problems it appears that moderately negative impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas and steep slope areas.

The extended use of the wetland/floodplain district would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The future growth projected to occur in Littleton appears to have slightly negative impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

However, some positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as wetlands/floodplain and aquifer protection districts. Because these environmental districts impose special constraints on development, they also function as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration

and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean clustering and less intensive uses than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future growth constitute a moderate amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low to moderately low-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The extended use of the wetlands/floodplain district in Littleton would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

The amount of potential wildlife habitat in Littleton is about 6960 acres or about 61% of the land in Littleton.

E. Air Quality Impacts. It is anticipated the growth patterns projected as a continuation of existing trends would have a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Littleton would be slight with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents.

In Littleton a few scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these floodplains, wetlands, or watershed protection districts would enhance open space or recreational areas and would therefore be

a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

In a few places in Littleton where open space could be affected by development, the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial or commercial development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. There are no known archaeological or historic sites in Littleton.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth in terms of the amount of land available in the community. The projected 1,000 housing units anticipated for Littleton means that about 900 acres of residential land will be developed over the 20-year period.

Littleton allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the use of environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts

in parts of the town and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle-income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is important to consider the potential impact of these costs upon such manufacturing establishments.

The recommendations for Littleton represents reliance on non-structural solutions to water quality problems and as a result it would seem that opportunities for employment in manufacturing would be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

Littleton has 133 jobs in water-intensive employment, which is expected to decrease slightly to 125 jobs by 1995. As a percentage of total employment in 1975 this is 7 percent and in 1995, 4 percent.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

MARLBOROUGH: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

About 85% of the city's current population is served by two separate sewerage systems and treatment plants. Wastewater collected from the central, northern, and eastern portions of the city is treated at the Easterly WTP prior to discharging to Hop Brook. This facility provides advanced waste treatment including two-stage activated sludge for oxidation of ammonia-nitrogen and chemical precipitation for phosphorus removal. Chlorination and step aeration are provided prior to discharge.

The Westerly WTP serves the western area of the city including most of Marlborough's industrial development plus an industrial park in Northborough. This facility provides secondary treatment by the activated sludge process followed by discharge to the Assabet River. Septage collected within the town is treated at the Easterly facility. It is recommended that:

- The City initiate a Step I facilities plan to upgrade the Westerly WTP to provide advanced waste treatment including nutrient removal.
- Where economically feasible, the City should extend its wastewater collection system to serve septic system problem areas.
- In order to protect against failures in areas which cannot be sewered, a preventive maintenance and inspection program should be developed and implemented.
- Sludge generated by both STP's is conditioned with Ferric chlorine and lime and dewatered by vacuum filtration. Dewatered sludge is landfilled at the Easterly WTP. It is recommended that this practice continue until the capacity of old landfill is reached. Within the next five years, the City should initiate a Step I Facilities Plan to evaluate long-range sludge disposal options including composting, land application, and resource recovery.

II. STORMWATER MANAGEMENT

The Highway Department performs operation and maintenance work on the stormwater collection system. Approximately 2,400 catch basins are cleaned on an annual basis. Drains and culverts are cleared of obstructions on an emergency basis and repaired or replaced if necessary. Recommendations to the town include the following:

- The city should evaluate the need for developing and implementing a brook channel inspection and maintenance program.
- In planning for future development, maximum use should be made of natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS.

Average annual local costs are as follows:

(1) Sewerage	\$183,000	(minimum sewer extension)
(2) Septage Treatment	6,400	
(3) Stormwater	169,800	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Six industries in Marlborough have been classified as significant. Dav-Tech Plating Lab, Inc., the Koehler Manufacturing Co., Massachusetts Container Corp. and the Butcher Polish Co. have been classified as significant because they may discharge toxic effluents to the Marlborough sewers. Gotham Ink of New England, Inc., was classified as significant because the company may discharge to a watercourse without the proper permit. The Stop & Shop Meat Processing Plant was classified significant because the plant discharges more than 50,000 gpd to the Marlborough sewers. Recommendations to the city include the following:

- The city should adopt a sewer use law comparable to the model sewer use law developed by MAPC. The city should also adopt a drain layer's manual to regulate the installation of sewer connections.
- Industries should be encouraged to practice water conservation and to recycle their process wastewater.

V. NON-POINT SOURCES

A. Landfills. The city has installed a leachate control system which should allow continued operation of the Route 85 - Hudson Street site for about 10 years. The city is continuing an ongoing study of alternative methods of solid waste disposal including recycling and incineration among others. Regional resource recovery programs are another option to consider in the future.

B. Salt Storage and Application. As the result of salt application practices as well as other problems (nutrients and bacteria), Marlborough's Millburn Reservoir has been reduced from serving 70-80 percent of the city's drinking water to 3-10 percent. Plans are underway to construct a filtration plant and expand the reservoir so that the city can rely less on MDC for water. In order to maintain the highest quality water possible in the reservoir, it is recommended that the city, together with MDPW, develop and implement a minimum or no-salt application program for the city similar to the following program.

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).

- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Marlborough should delineate and adopt wetlands/floodplain zoning to deal with identified water quality problems.

In addition, a watershed protection district would best address potential water quality problems in the city's reservoir.

An alternative to this piecemeal approach would be a comprehensive water resource protection district which would deal with existing and potential surface and groundwater problems.

In the future, other development controls that serve to minimize water quality problems include cluster zoning use and density changes and the adoption of an aquifer protection district.

VII. MANAGEMENT

It is recommended that the City Council authorize the initiation of a 201 facilities plan to upgrade the Westerly WTP to provide advanced waste treatment. The city's wastewater facilities are administered by the Department of Public Works. The city adopted a revised sewer use ordinance in 1975 which, while adequate, should be reviewed against the model sewer use ordinance and drain layers manual presented in this plan. A residential and industrial user change study is currently being prepared for the community.

The Board of Health should initiate a vigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping, to the reconstruction of failing systems, to requiring connection to the municipal collection system when a septic system fails or becomes a nuisance.

The city should establish a regional resource recovery planning committee to investigate solid waste disposal options from the future.

The Planning Board, with the Conservation Commission and Board of Health, should study the land use recommendations presented above in terms of any more detailed land use and natural features information available in the community. Zoning changes, consistent with the preventive land control recommendations presented above and with local policies and goals, should be prepared and presented to the City Council.

MARLBOROUGH: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
- II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
- III. Social Impacts
 - A. Open Space and Recreation
 - B. Archaeological and Historic
 - C. Housing
- IV. Economic Impacts
 - A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of Marlborough. The impact on the tax rate is included to indicate how the capital cost might affect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6% and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost would be \$184,100 for Marlborough, (not including stormwater costs), and this would result in an annual impact on the local tax rate of \$2.66. The annual operation and maintenance cost would be \$5,300.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for Marlborough, there appear to be moderately negative impacts. Potential erosion problems could occur in areas of steep slope, erodible soil, or sparse vegetation.

In those areas where the use of sewer service has been recommended as a solution for water quality, erosion problems would be aggravated for those potential erosion lands. This increased problem could result in two ways; one being short-term in duration, while the other one would be a long-term consequence.

A short-term negative impact of using sewers in an area considered as having erosion potential is that during the construction phase of the work there would be considerable disruption of the landscape. This removal of natural vegetation, plus the increased traffic for the construction work, would mean an increase in the potential for erosion.

An impact for erosion potential which would be of long-term significance in the use of sewers is that the intensity and density of land uses permitted in an area can be altered and increased with sewers. One effect of this change in permitted land uses would be that the more intensive development would aggravate existing erosion problems. This impact would last as long as the development and would tend to be irreversible.

Different effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

The amount of potential erosion areas affected by the recommendations in Marlborough appears to be approximately 300 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that both positive and negative impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

In those areas which are considered as having potential flood control problems, the use of sewers as outlined would increase the potential problems. This would be an adverse consequence of this water quality management program which would be long-term in duration. The opportunities for reversing such impacts once they have taken place would appear to be limited, although the use of sewers as a solution for water quality permits an area to accommodate a broader range of intensities and densities of land uses, without potential water quality degradation problems. Since an area with potential flooding problems should be maintained in its natural state as much as possible, so as to minimize flooding, the increased density of development in areas of sewer service would mean potentially increased flood control problems.

The adoption of the environmental, i.e., wetland/floodplain districts would have a positive effect on flood control problems. These regulations would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulations remained in effect.

The extent of the flood control problem areas affected by the recommendations appears to be about 880 acres in Marlborough. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for Marlborough appear to have both positive and negative impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

In undeveloped areas outlined for the use of sewers, there could be an accompanying increase in residential density from moderately low to medium density. Reduced development costs resulting from such a density change could increase the probability of development. Sewers in areas of groundwater favorability could mean that the water used in these areas would no longer be recharged to the ground; rather it would be carried out of the community, thereby greatly reducing groundwater recharge in these areas. Also, with increased development comes increased consumption of the groundwater through local wells.

Negative effects could result on the recharge capacity of these areas and also present contamination problems through infiltration. This can be seen as long-term impact, since any effects created would continue to occur throughout the lifetime of that development. Due to the low probability of reversing this type of effect once it is established, this impact could constitute an irreversible commitment of groundwater resources. The results of a negative impact might not be limited to a single area or community, since many communities utilize groundwater supplies common to more than a single town.

However, some positive effects on groundwater could accrue in areas where groundwater favorability coincides with recommended environmental zoning districts, such as floodplain and wetland overlay districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the water quality recommendations do constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

Areas outlined for sewer service would negatively affect wildlife by diminishing the capacity of the habitats to support wildlife. However, one positive effect could be that if growth and density were increased in the sewer service area, by clustering growth there, then the total amount of land needed to accommodate growth, in a more dispersed pattern, would be reduced. In this way more land could remain as potential wildlife habitats by remaining in a natural and undeveloped state.

The use of floodplain/wetland districts in Marlborough would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

The amount of potential wildlife habitat affected by these recommendations appears to be about 1,000 acres.

E. Air Quality Impacts. It is anticipated with the growth patterns projected in the recommendations, as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that the recommendations will have a negligible impact on air quality.

One short-term effect which would be very localized in significance would be that the level of particulate matter in the atmosphere would be expected to rise temporarily during the construction phase of the sewerage expansion because of the truck transportation of materials and supplies to and from the construction sites.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Marlborough would be slight with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents. In a few areas in the basin, small open space parcels are adjacent to or surrounded by land zoned for industrial use. Impacts from this type of development on open space could be slightly negative, long-term, but primarily of local importance.

In Marlborough, several scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these floodplains, wetlands, or watershed protection districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

Development pressures could increase if sewers were built in presently undeveloped areas, resulting in greater use of open spaces for recreation. It should be noted that, while sewer construction would allow for higher residential densities, if the projected population growth remains about the same, through a phased growth management system as discussed in Part II, Section 5, that growth could be accommodated on less total acreage, thus leaving more open land for recreation and aesthetic enjoyment. Impacts would be long-term and of local significance.

In a few places in Marlborough where open space could be affected by development, the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, commercial, or moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased according to the land development control recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. A review of the potential impacts of the recommendations on existing archaeological and historic sites in Marlborough indicates that the growth pressure would create a minimal impact on existing sites. These few sites are zoned for moderately high density residential development. Certainly when a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss of any of the archaeological or historic sites would be regional in significance.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the Environmental Assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth in terms of the amount of land available in the community. The projected 3700 housing units anticipated for Marlborough means that about 2700 acres of residential land will be developed over the 20-year period.

Marlborough allows a moderate amount of low density development. Since the cost of land is a significant factor in the total cost of housing and, obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, the low density residential development in this city may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the outlined environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

However, the reduction in residential lot sizes that could accompany the outlined sewers might permit the construction of more moderately-priced housing. In terms of alleviating the short supply of such housing, locally and regionally, such an outcome would produce a positive impact. Average on-site land costs may be reduced from \$17,000-\$22,000 under basic one-acre requirements to \$11,000-\$15,000 under medium density requirements. This is a significant reduction that, together with the advent of sewers, would enhance development potential significantly.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and

environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors combine to affect a moderate amount of land, and thus could somewhat reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the city, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle-income families may become more difficult, despite the positive impact on housing with the use of sewers in some areas of the city.

IV. ECONOMIC IMPACTS

A. Manufacturing. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is important to consider the potential impact of these costs upon such manufacturing establishments.

It can be seen that the recommendations would have both potentially positive and negative impacts on manufacturing. The expansion and use of sewer service areas as outlined in Marlborough would allow opportunities for increased levels of manufacturing activities, and thereby increase employment levels. The principal reason for such an effect is that with the introduction of sewer service to industrial land, these areas could assimilate more structural development, which could then accept more labor-intensive economic activities. An example might be the difference between a warehouse employing only a half-dozen people and an electrical machinery plant employing a few hundred. Indeed, the presence of sewerage might encourage some towns to rezone areas for industrial use, given the proper market, and other economic conditions.

Counterbalancing this increased opportunity for accommodating manufacturing activities is the requirement that industries pay a proportional share of the capital costs of sewage treatment, based on their share of the waste load. This potential cost to industries could inhibit plant expansion, or initial location, thereby precluding the full measure of employment opportunities.

The recommendations for Marlborough represent reliance on non-structural solutions to water quality problems and as a result it would seem that opportunities for employment in manufacturing would be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

Marlborough has about 500 jobs in water-intensive employment, which is expected to increase to about 1070 by 1995. As a percentage of total employment in 1975, this is about 6 percent, and in 1995, about 8 percent.

As 201 facilities planning is done, detailed analysis of pre-treatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

MAYNARD: RECOMMENDED 203 PLAN

I. WASTEWATER TREATMENT

The town's wastewater collection system serves about 90 percent of the existing population. Sewage is treated at town's activated sludge secondary treatment plant prior to discharge to the Assabet River. The MDWPC has required that a facilities plan be undertaken to provide advanced waste treatment to include nutrient removal and increase BOD and suspended solids removal efficiencies. According to town officials, septage collected from the unsewered population is delivered to the Acton septage treatment lagoons for disposal.

It is recommended that:

- The town should submit an application for a Step 1 facilities planning grant to evaluate advanced treatment alternatives including combining the secondary effluents from both the Concord and Maynard treatment plants at one facility or the other to provide advanced treatment. At this time, it does not appear that there is any justification for mandating a regional facility to serve Concord, Littleton, Acton and Maynard as Concord and Maynard both have treatment facilities and both Acton and Littleton have not been shown to require sewerage within the study period.
- Provision should be made in the Facilities Plan, referred to above, for the town to provide septage treatment facilities at the Maynard plant to serve the town of Maynard and possibly the town of Stow.
- Sewer service should be extended to problem areas where economically feasible.

II. STORMWATER MANAGEMENT

The Highway Department is responsible for operation and maintenance of the stormwater collection system. Catch basin cleaning is currently contracted out. The town, however, is considering the purchase of a hydraulic cleaner. Culverts and brooks are cleaned by the Department as required.

Recommendations to the town include:

- In planning for future development, maximum use should be made of the existing system where possible, and natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

Average annual local costs are as follows:

(1) Sewerage	\$42,000	
(2) Septage Treatment	1,700	
(3) Stormwater	51,600	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Two industries in Maynard have been classified as significant. Digital Equipment Corporation has an NPDES permit application on file for discharges to the Assabet River. Hycomp, INC. was classified as significant because the firm's discharge to the Maynard sewers may contain toxic wastes.

Recommendations to the town include the following:

- The town should adopt a sewer use law comparable to the model sewer use law developed by MAPC. A drain layer's manual is also recommended to regulate the installation of sewer connections.
- Water conservation and recycling of process wastewater should be encouraged.

V. NON-POINT SOURCES

A. Landfills. Problems of leachate generation at the Waltham Street landfill have largely been corrected following the construction of an impervious dike around the facility. The site will reach its capacity soon and should be closed in accordance with DEQE approved plans. It is recommended that monitoring be undertaken to assess the need for any additional measures which might be required to prevent further pollution.

Regional resource recovery programs should be considered as a future solid waste option.

B. Salt Storage and Application. Road salt was not shown to be a problem in Maynard. However, it is recommended that, in order to protect both ground and surface water supply, a salt application program, similar to the one that follows, be developed and implemented by local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Maynard should enact a wetlands/floodplain zoning bylaw to deal with identified water quality problems. This community should also delineate an aquifer protection district since it relies on groundwater and wells for water supply. As an alternative to this piecemeal approach, Maynard should consider

a comprehensive water resource district which would address both existing and potential surface and groundwater problems.

In the future, Maynard should consider protection of its streams and the watersheds of ponds or reservoirs.

In addition, the town should give serious consideration to a revision in the permitted land uses if the Natick labs area becomes available for development. Revisions should also include cluster zoning as an alternative pattern of development that could minimize potential water quality problems.

VII. MANAGEMENT

Maynard's town meeting should authorize the initiation of a 201 facilities plan for the community in order to evaluate advanced treatment alternatives. The plan should consider septage disposal at the municipal facility. If the town of Stow is to use this facility for septage disposal then an intermunicipal agreement would be necessary.

Maynard's wastewater facilities are currently administered by the Department of Public Works. The town adopted a new sewer ordinance in 1975, which is generally adequate but should be reviewed against the model sewer use ordinance and drain layer's manual presented in this plan.

The town's sewer use changes are in accordance with regulations of EPA's Municipal Treatment Works Construction Grants Program.

The Board of Health should monitor the operation and closing of the Waltham Street landfill to insure compliance with state landfill regulations and DEQE approved plans.

The Maynard Planning Board, working with the Conservation Commission and the Board of Health should consider the land use recommendations made above. Land use and natural features information which is more detailed than the MAPC information should, of course, be referred to. A more detailed delineation of the aquifer recharge area in the community would be desirable, and town meeting should be asked to authorize such a study. Zoning changes, consistent with the preventive land control recommendations presented above, and with local goals and policies, should be developed and presented for town meeting approval.

MAYNARD: IMPACT ASSESSMENT

Categories

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological & Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of Maynard. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6% and is the figure discussed in Part II, Section 2.

The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost would be \$42,200 for Maynard, (not including storm-water costs), and this would result in an annual impact on the land tax rate of \$0.77. The annual operation and maintenance cost would be \$1,500.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for Maynard there appear to be moderately positive impacts. Potential erosion problems could occur in areas of steep slope, erodible soils, or sparse vegetation.

Positive effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

The amount of potential erosion areas affected by the recommendations in Maynard appears to be approximately 200 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that moderately positive impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The adoption of the environmental, i.e. wetlands/floodplain districts would have a positive effect on flood control problems. These regulations would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulations remained in effect.

The extent of the flood control problem areas affected appears to be about 140 acres in Maynard. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for Maynard appear to have generally positive impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as floodplain and wetlands protection districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the

infiltration and replenishment of groundwater. The position effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability or recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assess should be done concurrently with the 201 planning.

D. Wildlife Impacts. The area of potential wildlife habitat which possibly could be affected by the water quality recommendations constitute a moderate amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as moderate-density type of development which has been occurring up to now means that urban development is dispersed across the community.

One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats.

The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The use of wetlands/floodplain districts in Maynard would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

The amount of potential wildlife habitat affected by these recommendations appears to be about 240 acres, or about 25 percent of the potential wildlife habitat in Maynard.

E. Air Quality Impacts. It is anticipated with the growth patterns projected as a continuation of existing trends, that the ambient air quality standards will be maintained through 1985 even with the estimated growth. It can be said in summary that future growth would have a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space & Recreation Impacts. Generally, impacts on public and semi-public lands in Maynard would be slight with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned for medium density residential development. Development of this density could result in more use of existing open space and recreation areas by the residents.

In Maynard a few scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these floodplains, wetlands, or watershed protection districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

In a few places in Maynard where open space could be affected by development the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial, commercial, or moderate to high residential density development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased according to land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological & Historic Impacts. There are no known archaeological or historic sites in Maynard.

C. Housing Impacts. There appears to be little overall difficulty in accommodating the anticipated residential growth in terms of the amount of land available in the community. The projected 400 housing units anticipated for Maynard means that about 200 acres of residential land will be developed over the 20-year period.

Residential land in Maynard is all zoned for medium to high density development. In addition, Maynard allows for construction of multi-family housing. Therefore, housing impacts in this community would be minimal.

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is important to consider the potential impact of these costs upon such manufacturing establishments.

The recommendations for Maynard represents reliance on non-structural solutions to water quality problems and as a result it would seem that opportunities for employment in manufacturing would be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

Maynard has about 200 jobs in water-intensive employment which is expected to decrease to about 55 jobs in 1995. As a percentage of total employment, in 1975 this is three percent and in 1995, less than one percent.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

SOUTHBOROUGH: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

The entire town is presently served by on-site methods of waste disposal, particularly septic systems and cesspools. Septage is reportedly disposed in neighboring towns, however Marlborough and the MSD (via Framingham) have refused to accept Southborough's septage. In light of the fact that 85 percent of the land area of the town lies in the watershed of a major potential source of water supply (Sudbury Reservoirs) and that Southborough has stated its preference to maintain on-site waste disposal systems, it is recommended that:

- As an interim solution, the town should try to contract with MDC, or make arrangements to dispose of septage at either the Northborough or Marlborough Westerly treatment plants.
- The town should initiate meetings with the town officials in Holliston and Hopkinton to join together to find a regional septage treatment solution.
- The town should undertake a Step 1 Facilities Plan to determine the town's existing and potential needs for non-structural and structural means of wastewater disposal.
- The town should adopt a rigorous preventive maintenance and inspection program.

II. STORMWATER MANAGEMENT

The Highway Department operates and maintains the stormwater collection system. All catch basins are cleaned at least yearly. Those in areas where sand accumulation is a problem are cleaned two or three times per year. Lines are flushed to remove obstruction when the need arises.

Recommendations to the town include the following:

- The town should consider funding a town-wide drainage survey to determine future drainage needs.
- A survey should be undertaken in the Southville-Cordaville area to determine the extent of drainage facilities in the area.
- The town should coordinate with the MDC for brook channel inspection and maintenance.
- In planning for future development, maximum use should be made of natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

Average annual local costs are as follows:

(1) Sewerage	0	
(2) Septage Treatment	\$12,000	
(3) Stormwater	\$76,350	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

One industry in Southborough has been classified as significant. L.B. Darling Company, Inc., was classified as significant because the firm may discharge to a watercourse without the proper permit.

Recommendations to the town include the following:

- Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public water supplies.
- Industries should be encouraged to practice water conservation and to recycle their process wastewater.

V. NON-POINT SOURCES

A. Landfills. The former town landfill on Parkerville Road which was closed during 1966, was identified by both town officials and MAPC sampling to be a potential water quality threat to the Sudbury Reservoir. A plan to seal the landfill has not yet been implemented due to funding limitations. It is recommended that MDC, DEQE and the town work together to monitor the fill and to implement the plans to seal the fill as soon as possible. Potential involvement in regional resource recovery programs in Worcester County area should continue to be pursued as future solid waste option.

B. Salt Storage and Application. Road salt was not identified as a threat to drinking water in Southborough as the town relies on MDC for its water. It is recommended, however, that DPW, MDC and the town establish a sensitive salt program to protect the reservoirs. A sample program follows:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

C. Other Potential Non-point Sources.

- Commercial establishments may not be taking sufficient precaution to manage their own disposal problems.
- Agricultural enterprises may not be taking sufficient precaution to insure water quality protection.

VI. PREVENTIVE LAND USE CONTROLS

Southborough should employ cluster zoning to deal with a general soils problem. Otherwise, environmental zoning is presently adequate to protect its water resources.

In the future though, this town may want to consider extending of its wetlands and floodplains districts and adopting an aquifer protection district to maintain the recharge function in areas of high groundwater favorability.

Also for future consideration, revisions to the zoning by-law could be used to minimize potential water quality problems.

VII. MANAGEMENT

Southborough should initiate discussions with the MDC relative to a short term septage disposal contract. The MDC by regulation, will not accept non-member septage after December 31, 1979. However, the MSD does not have a moratorium on accepting septage from non-member communities, nor has the MDC refused to take Southborough's septage. The town should, at the same time, initiate discussions with Holliston and Hopkinton relative to a regional septage disposal solution. Holliston currently has a septage study committee. It is recommended that Southborough form a similar committee.

Southborough town meeting should authorize the initiation of a 201 facilities plan to evaluate, in detail, municipal wastewater disposal alternatives, including membership in the MSD and the feasibility of long term reliance on on-site disposal.

The Board of Health should initiate a rigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems.

There should also be a consideration of a mandatory inspection and maintenance program for the community. Such a program could take many forms (see Part II of this plan), depending upon the resources and goals of the community. The planning for such a program should prompt consideration of a regional board of health depending upon the economies of scale, and the local political feasibility. Such a regional entity should be consistent with any proposed regional septage disposal configuration.

Southborough should undertake, under the auspices of the Board of Health and the Department of Public Works, and in conjunction with DEQE and MDC, a groundwater and surface water monitoring program to conclusively determine the water quality impacts of the former town landfill. The Board of Health should loosely monitor the closing of this landfill to insure compliance with state regulations.

The Southborough Planning Board, working with the Conservation Commission should consider the land use recommendations made above. Land use and natural features information which is more detailed than the MAPC information should, of course, be referred to. A more detailed delineation of the aquifer recharge area in the community would be desirable, and town meeting should be asked to authorize such a study. Zoning changes, consistent with the preventive land control recommendations presented above, and with local goals and policies, should be developed and presented for town meeting approval.

Southborough town meeting has formed a Citizens Planning Committee to formulate growth policy for the town and to recommend means of implementation. That committee should review the water quality recommendations above for possible inclusion in a town growth policy.

SOUTHBOROUGH: IMPACT ASSESSMENT

Categories:

I. Direct Cost Impacts

II. Environmental Impacts

- A. Erosion
- B. Flood Control
- C. Groundwater
- D. Wildlife
- E. Air Quality

III. Social Impacts

- A. Open Space and Recreation
- B. Archaeological and Historic
- C. Housing

IV. Economic Impacts

- A. Manufacturing

I. DIRECT COST IMPACTS

In the final analysis cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of Southborough. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over

a 20-year bond issue amortized at 6% and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost would be \$1,600 for Southborough, (not including stormwater costs), and this would result in an annual impact on the local tax rate of \$0.03. The annual operation and maintenance cost would be \$10,400.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the anticipated future development in Southborough, there appear to be moderately negative impacts. Potential erosion problems could occur in areas of steep slope, erodible soils, or sparse vegetation.

Different effects would result in those areas where the intensity of permitted development would be reduced, either by not conflicting with the environmental capability of the land, or by not sewerage the area. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

The amount of potential erosion areas affected by the recommendations in Southborough appears to be approximately 90 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of the projected growth in terms of potential flood control problems, it appears that moderately negative impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extended use of wetland and floodplain districts would have a positive effect on flood control problems. These regulations would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulations remained in effect.

The extent of the flood control problem areas appears to be about 600 acres in Southborough. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The future growth projected for Southborough appear to have slightly negative impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

However, some positive effects on groundwater could accrue in areas where groundwater favorability coincides with recommended extension

of environmental zoning districts, such as floodplain and wetland overlay districts. Because these environmental districts impose special constraints on development, they also function, to a certain measure, as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability or recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future development constitute a moderate amount of the habitat areas which are currently available in the community. The continuation of growth as low-density type of development which has been occurring up to now is not a problem and will not likely be unless major agricultural holdings are subdivided.

The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The extended use of floodplain and wetlands districts in Southborough would provide a benefit for wildlife. The development constraints imposed by these land use regulations would provide local benefits for as long as the regulation was in effect.

E. Air Quality Impact. It is anticipated that the growth patterns projected as a continuation of existing trends would have a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Southborough would be minimal with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate residential. Development of this density could result in more use of existing open space and recreation areas by the residents.

In Southborough a few scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these floodplains, wetlands, or watershed protection districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

B. Archaeological & Historic Impacts. There are no known impacts on archaeological or historic sites in Southborough.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth outlined in terms of the amount of land available in the community. The projected 680 housing units anticipated for Southborough means that about 600 acres of residential land will be developed over the 20-year period.

Southborough allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration. However, more than half of the 680 units could be accommodated on existing 1/2 acre lots thus minimizing the problem.

Furthermore, the outlined environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

The land development recommendations for zoning changes could reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town, and the concomitant higher cost associated with larger lot requirements, access to housing opportunities for middle-income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is important to consider the potential impact of these costs upon such manufacturing establishments. Manufacturing is not a major activity in Southborough and should it become such the town is urged to take appropriate precautionary measures.

Southborough has less than 10 jobs in water-intensive employment which is expected to increase slightly, to about 40 jobs by 1995. As a percentage of total employment, in 1975 this is less than one percent and in 1995, projected to be about two percent.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

STOW: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

The entire town relies on septic systems and cesspools for wastewater disposal. Due largely to large lot zoning and effective code enforcement, septic system problem areas are not significant. In the absence of identified septage disposal areas, the provision of adequate septage treatment and disposal facilities is a high priority for the town.

It is recommended that:

- The town seeks an agreement with the town of Maynard for septage disposal and treatment at the Maynard Wastewater Treatment Plant.
- The town adopt a preventive maintenance and inspection program to ensure the continued viability of on-lot disposal systems.

II. STORMWATER MANAGEMENT

Operation and maintenance work for the drainage system is done by the Street Department. Catch basins are cleaned on an annual basis.

Recommendations to the town include the following:

- Outfalls and receiving streams should be inspected periodically and cleaned when necessary.
- In planning for future development, maximum use should be made of natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

Average annual local costs are as follows:

(1) Sewerage	0	
(2) Septage Treatment	\$14,100	
(3) Stormwater	\$57,000	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

One significant industry was identified in Stow. J. Melone & Sons, Inc. has an NPDES permit application on file for discharges to Stow Brook.

Recommendations to the town include the following:

- Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public water supplies.
- Industries should be encouraged to practice water conservation and to recycle their process wastewater.

V. NON-POINT SOURCES

A. Landfills. It is recommended that the town prepare final plans for closing and sealing of the South Acton Road site and include provision for monitoring. Stow should initiate discussions with the town of Hudson to make joint use of Hudson's proposed new facility.

B. Salt Storage and Application. It is recommended that the town develop a sensitive salt application program to prevent sodium contamination in the town's groundwater water supply. A sample program follows. It is recommended to local and state highway units.

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Stow should delineate an aquifer protection district since it has currently unprotected high yield aquifers throughout the town.

Stow should also employ clustering as a land use control mechanism that would serve to minimize groundwater contamination.

In the future, Stow should consider extending its wetlands protection to a few small areas presently not covered in the overlay district.

VII. MANAGEMENT

The town of Stow should begin negotiating with Maynard for an inter-municipal contract for the disposal of septage at the Maynard Wastewater Treatment Plant.

The Board of Health should initiate a rigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners in non-sewered areas should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping, to the reconstruction of failing systems. The Stow Conversation Commission has stated that the money and time necessary to conduct a townwide mandatory inspection and maintenance program can be better spent elsewhere. In light of present water quality information this assessment cannot be disputed. However, voluntary maintenance by the homeowner should be actively encouraged. It is not only the homeowner who benefits from a properly functioning system.

The Board of Health should monitor the closing of the South Acton Road landfill to insure that state regulations are complied with.

The town Planning Board, with the Conservation Commission, should study the land use recommendations presented above in terms of any more detailed land use and natural features information available in the community. The delineation of an aquifer protection district should be supported by hydrologic studies defining the aquifer. Town Meeting should appropriate funds for such studies. Zoning changes, consistent with the preventive land control recommendations presented above and with local policies and goals, should be prepared and presented for Town Meeting approval.

The average annual cost would be \$1800 for Stow, (not including stormwater costs), and this would result in an annual impact on the local tax rate of \$0.03. The annual operation and maintenance cost would be \$12,300.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of projected future development in Stow there appear to be slightly negative impacts. Potential erosion problems could occur in areas of steep slope, erodable soils, or sparse vegetation.

Different effects would result in those areas where the type of permitted development would be changed, so as not to conflict with the environmental capability of the land. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

The amount of potential erosion areas affected by the recommendations in Stow appears to be approximately 40 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effect.

B. Flood Control Impacts. When assessing the potential effects of the anticipated growth in terms of potential flood control problems, it appears that slightly negative impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The extended use of the floodplain/wetlands protection district would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

The extent of the flood control problem areas appears to be about 100 acres in Stow. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The future development anticipated to occur in Stow appear to have slightly negative impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

However, positive effects on groundwater could accrue in areas where groundwater favorability coincides with environmental zoning districts, such as aquifer protection and floodplain/wetlands protection districts. Because these environmental districts impose special constraints on development, they function as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

STOW: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
 - II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
 - III. Social Impacts
 - A. Open Space & Recreation
 - B. Archaeological & Historic
 - C. Housing
 - IV. Economic Impacts
 - A. Manufacturing
-

I. DIRECT COST IMPACTS

In the final analysis cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of Stow. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since any other taxing mechanism could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6% and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean less intensive land uses than what is presently allowed in the zoning bylaw, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future growth constitute a moderate amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low-density type of development which has been occurring up to now means that urban development is dispersed across the community.

One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats.

The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The amount of potential wildlife habitat in Stow is approximately 4800 acres or about 40% of the land in Stow.

E. Air Quality Impacts. It is anticipated that the growth patterns projected as a continuation of existing trends would have a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Stow would be minimal with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned for low residential density development. A low density pattern of development would not be considered incompatible with open space or recreation areas.

B. Archaeological and Historic Impacts. There are no known archaeological or historic sites in Stow.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth in terms of the amount of land available in the community. The projected 670 housing units anticipated for Stow means that about 1200 acres of residential land will be developed over the 20-year period.

Stow allows only low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the outlined environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications both locally and regionally. With more extensive use of protective districts in parts of the town and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle-income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is important to consider the potential impact of these costs upon such manufacturing establishments.

The recommendations for Stow represent reliance on non-structural solution to water quality problems and as a result it would seem that opportunities for employment in manufacturing could be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

Stow has less than 20 jobs in water-intensive employment which is expected to remain about the same by 1995. As a percentage of total employment, in 1975 this is about 3 percent and in 1995, about one percent.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

SUDBURY: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

Sudbury is entirely served by septic systems with the exception of the Lincoln-Sudbury Regional High School which is served by a package treatment plant providing secondary treatment to an average daily flow of about 14,700 GPD during the school year. The town already operates an effective septic system maintenance program. Sudbury and Wayland have joined together to develop a joint regional septage treatment facility. Step 2 Design of this facility is expected to be underway in 1978. It is anticipated that this facility will be in operation by late 1979 or early 1980 if all proceeds well through Step 2 and Step 3 construction. It is recommended that:

- The town, together with the town of Wayland, continue towards the implementation of the joint regional septage treatment facility.
- The town expand its septic system maintenance and inspection program.
- The towns of Wayland and Sudbury negotiate with the towns of Weston and Lincoln the possibility of treating septage from those towns for as long as capacity is available at the proposed facility.

II. STORMWATER MANAGEMENT

The Highway Department provides services to operate and maintain the stormwater collection system. Catch basins and culverts are cleaned on a regular basis. Recommendations to the town include:

- A stream inspection and maintenance program should be developed and implemented.
- Adequate capacity to prevent flooding and associated damage should be provided.
- In planning for future development, maximum use should be made of natural drainage and non-structural runoff control measures.

III. ESTIMATED COSTS

Average annual local costs are as follows:

Sewerage	0	
Septage Treatment	\$22,600	
Stormwater	156,450	(much of this cost already may be in local budgets)

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Two industries in Sudbury have been classified as significant. The Linde Corp. and Union Carbide Corp. have NPDES permit applications on file for discharges to the Sudbury River and Wash Brook, respectively. Recommendations to the town include the following:

- Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public water supplies.
- Water conservation and recycling of process wastewater should be encouraged.

V. NON-POINT SOURCES

A. Landfills. It is recommended that the town should continue their on-going monitoring program which should serve as a model to other communities throughout the area and that the town continue to operate its landfill in accordance with the DEQE approved plans for operation. The town should consider a regional landfill or regional resource recovery program as future solid waste options.

B. Salt Storage and Application. Massachusetts DPH tests show rising chloride and sodium levels in Sudbury wells drawing the town's water supply from groundwater aquifers. It is recommended that the town and the state DPW develop a sensitive salt application program to protect the town's water supplies. Road salt should be stored in covered sheds with impervious floors if contamination is found in sampling beyond the site.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

Sudbury should adopt wetlands zoning to deal with existing water quality problems as well as an aquifer protection district to protect its groundwater for water supply.

The town should also rezone in areas where permitted uses would be incompatible with the land's environmental capability.

The town should also employ cluster zoning which would serve as further protection of groundwater.

In the future, Sudbury should consider other measures to protect its water resources, such as delineating a stream buffer district and/or a watershed protection district.

VII. MANAGEMENT

The Town of Sudbury has already entered into an intermunicipal agreement with the Town of Wayland for the construction and operation of a joint regional septage treatment facility, and the Board of Health plans to vigorously promote a program of routine septic system maintenance once this facility is completed. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems. Preferably, a program providing for periodic inspection of septic systems, and pumping when necessary would be instituted. Such a program could take many forms (see Part II of this plan). Special attention should be given to industries discharging sanitary and process wastewater to the ground, particularly near water supplies.

The town Planning Board, with the Conservation Commission, should study the land use recommendations presented above in terms of any more detailed land use and natural features information available in the community. Zoning changes, consistent with the preventive land control recommendations presented above and with local policies and goals, should be prepared and presented for town meeting approval.

SUDBURY: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
 - II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
 - III. Social Impacts
 - A. Open Space and Recreation
 - B. Archaeological and Historic
 - C. Housing
 - IV. Economic Impacts
 - A. Manufacturing
-

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of Sudbury. The impact on the tax rate is included to indicate how the capital cost might affect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6% and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be required each year of operation.

The average annual cost would be \$2,900 for Sudbury (not including storm-water costs), and this would result in an annual impact on the local tax rate of \$0.02. The annual operation and maintenance cost would be \$19,700.

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for Sudbury, there appear to be slight impacts. Potential erosion problems could occur in areas of steep slope, erodible soils, or sparse vegetation.

Different effects would result in those areas where the intensity of permitted development would be reduced, so as not to conflict with the environmental capability of the land. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

The amount of potential erosion areas affected by the recommendations in Sudbury appears to be approximately 5 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effects.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that positive impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas, and steep slope areas.

The adoption of a wetlands district would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

The extent of the flood control problem areas appears to be 235 acres in Sudbury. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for Sudbury appear to have minimal impact on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Positive effects on groundwater could accrue in areas where groundwater favorability coincides with recommended aquifer protection and wetlands protection districts. Because these environmental districts impose special constraints on development, they function as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would continue for as long as the environmental districts are in force.

Another potentially positive impact would result from the implementation of recommended land management controls. Revised land use controls would mean less intensive land uses than what presently is allowed in the zoning bylaw, thus enhancing the potential for more infiltration and recharge to the ground water. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by future growth projected for Sudbury constitute a moderate amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The use of a wetlands district in Sudbury as recommended would provide a benefit for wildlife. The development constraints imposed by this land use regulation would provide local benefits for as long as the regulation was in effect.

E. Air Quality Impacts. It is anticipated that the growth patterns projected, as a continuation of existing trends, would have a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Sudbury would be minimal with development according to the recommended solutions. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderate density residential development. Development of this density could result in more use of existing open space and recreation areas by the residents.

In Sudbury, a few scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these wetlands or watershed protection districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay zoning districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

In several places in Sudbury where open space could be affected by development, the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for industrial or commercial development would become zoned for low to moderate density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. A review of the potential impacts on existing archaeological and historic sites in Sudbury indicates that the growth pressure would create negative impacts on several sites. These sites are currently available for development or they are adjacent to such undeveloped areas. Certainly when a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss of any of the archaeological or historic sites would be regional in significance.

In addition to the future growth pressure on archaeological sites, the recommendations indicate potential positive impact on a few of the sites. These are located within environmental zoning districts, such as the recommended wetlands district. The provisions of these districts act as development constraints, thus giving additional protection to the archaeological sites.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accommodating the anticipated residential growth in terms of the amount of land available in the community. The projected 2,000 housing units anticipated for Sudbury means that about 2,300 acres of residential land will be developed over the 20-year period.

Sudbury allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant

land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the outlined environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle-income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. The process of cleaning up area waterways and waterbodies in line with national goals will involve a joint effort of government and private enterprise. Because this effort will involve a sharing of capital costs between government and water-using firms, it is important to consider the potential impact of these costs upon such manufacturing establishments.

The recommendations for Sudbury represent reliance on non-structural solutions to water quality problems and as a result it would seem that opportunities for employment in manufacturing would be reduced. There may be some cases in which some opportunities may be foreclosed because of actual changes in zoning from industrial to low-to-medium density residential uses. Some existing manufacturing activities may be affected by such zoning changes by making them non-conforming land uses. This would have implications for their future expansion plans.

Sudbury has about 140 jobs in water-intensive employment, which is expected to decrease to about 100 by 1995. As a percentage of total employment, in 1975 this is about 3 percent and in 1995, about one percent.

As 201 facilities planning is done, detailed analysis of pretreatment requirements and user charges should outline the potential effect on manufacturing activities in the community.

WAYLAND: RECOMMENDED 208 PLAN

I. WASTEWATER TREATMENT

The entire town utilizes septic systems as on-site wastewater disposal systems. Wayland and Sudbury have joined together to develop a joint regional septage treatment facility. Step 2 design of this facility is expected to be underway in 1978. It is anticipated that the facility will be in operation by late 1979 or early 1980 if all proceeds well through Step 2 and Step 3 construction. It is recommended that:

- The town continue to rely on on-site wastewater disposal via septic system
- The town should develop and implement a program of preventive septic system maintenance and inspection to ensure the continued viability of on-site systems
- The town together with the town of Sudbury, continue towards the implementation of the joint regional septage treatment facility
- The towns of Wayland and Sudbury negotiate with the towns of Weston and Lincoln, the possibility of treating septage from these towns for as long as capacity is available at the proposed facility.

II. STORMWATER MANAGEMENT

The Highway Department is responsible for operation and maintenance of the stormwater collection system. Maintenance is performed largely on a corrective basis. Recommendations to the town include the following:

- The town should develop a regular program of catch basin and outfall inspection and cleaning.
- The town should undertake a comprehensive, townwide drainage survey to identify existing system needs and future requirements.
- A program of stream maintenance should be developed and implemented.
- In planning for future development, maximum use should be made of natural drainage and non-structural runoff control measures.

III ESTIMATED COSTS

Average annual cost is as follows:

- | | |
|-----------------------|--|
| (1) Sewerage | 0 |
| (2) Septage Treatment | \$17,200 |
| (3) Stormwater | \$126,750 (much of this cost already may be in local budgets.) |

An explanation of cost estimation methodologies appears in Part II of this draft Areawide Plan.

IV. INDUSTRIAL WASTEWATER

Two significant industries have been identified in Wayland. Raytheon Company has been issued an NPDES permit for the discharge of treated sanitary and process wastewater to the Sudbury River. Doms Cleaners, Inc. has an NPDES permit application on file for the discharge of uncontaminated cooling water to Snake Brook. Recommendations to the town include the following:

- Industrial discharges to the ground should be monitored to protect the groundwater, especially in areas near public water supplies.
- Industries should be encouraged to practice water conservation and to recycle their process wastewater.

V. NON-POINT SOURCES

A. Landfills. It is recommended that monitoring be undertaken as part of the development of final plans for operation and closing and sealing of the Route 20 landfill.

B. Salt Storage and Application. Although it does not appear that road salt contamination is yet a problem in Wayland, it is recommended that the town and the Mass DPW develop a sensitive salt program to protect its groundwater supplies. Road salt should be stored in covered sheds with impervious floors if contamination is found beyond the site.

The following program to prevent road salt contamination is recommended for all local and state highway units:

- Development of maps showing local drainage basins and road networks with locations of salt-sensitive targets (aquifers, wells, streams tributary to reservoirs).
- Development of a selective application program that designates specific parts of the road network as no salt or minimum salt zones. Evaluation of snow dumps.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation. Education of local citizens about their responsibility under winter driving conditions.

VI. PREVENTIVE LAND USE CONTROLS

This community should delineate an aquifer protection district since it has currently unprotected areas of high groundwater favorability throughout the town. Additional groundwater protection would also be achieved by

more extensive use of cluster zoning. This land use control technique would also allow development in areas of limited soil capability.

In the future, Wayland should consider some additional protection of its water resources, for example, by extending its wetlands district and by delineating a stream buffer district or a watershed protection district.

Also for future consideration, revisions to the zoning by-law could be used to minimize potential water quality problems.

VII. MANAGEMENT

The Town of Wayland has already entered into an intermunicipal agreement with the Town of Sudbury for the construction and operation of a joint regional septage treatment facility. There should be discussions with the communities of Weston and Lincoln relative to intermunicipal contracts from accepting septage from those communities at the Wayland/Sudbury facility.

The Board of Health should initiate a rigorous maintenance and inspection program for on-site sewage disposal systems. At a minimum, a public education program, setting guidelines for the proper maintenance of septic systems and mailing such guidelines to homeowners should be set up. In addition, information on malfunctioning systems should be verified and appropriate administrative actions promptly instituted against such systems, ranging from pumping to the reconstruction of failing systems. The Town currently intends to institute some kind of program to encourage proper maintenance of septic systems once the septage disposal facility is completed, recognizing the beneficial aspects of regular septic system maintenance. However, the community does not, at this time, favor the use of the police power to carry out a mandatory inspection and maintenance program. The town has records of septic system repairs from 1974. A public information/voluntary maintenance program should reduce repair rates. If this proves to be the case a mandatory program would not be necessary.

The Board of Health should closely monitor the operation and closing of the Route 20 landfill to insure compliance with state landfill regulations.

The Planning Board, working with the Conservation Commission and the Board of Health should review the land use recommendations made above. Local land use and natural features information which is more detailed than the MAPC information should, of course, be referred to a more detailed delineation of the aquifer recharge area in Wayland would be desirable and town meeting should be asked to authorize such a study. Zoning changes, consistent with the preventative land control recommendations, and with local goals, policies and plans should be developed and presented for town meeting approval.

WAYLAND: IMPACT ASSESSMENT

Categories:

- I. Direct Cost Impacts
 - II. Environmental Impacts
 - A. Erosion
 - B. Flood Control
 - C. Groundwater
 - D. Wildlife
 - E. Air Quality
 - III. Social Impacts
 - A. Open Space and Recreation
 - B. Archaeological and Historic
 - C. Housing
 - IV. Economic Impacts
 - A. Manufacturing
-

I. DIRECT COST IMPACTS

In the final analysis, cost effectiveness will play a major role in the selection of one water quality solution over another, and the question, "How much will it cost?", is often one of the first concerns in considering the management of water quality. For this reason, the direct cost impacts of the recommendations are presented here. The direct cost impact involves two types of expenses: (1) capital and (2) operating and maintenance. It should be remembered that, while the capital cost will affect the community only for the length of the repayment schedule, the annual operation and maintenance cost will continue throughout the use of the system.

The direct cost impacts shows the average annual capital cost and what effect this annual cost would have on the property tax rate of Wayland. The impact on the tax rate is included to indicate how the capital cost might effect an individual resident in the community. This does not mean that the property tax would be the mechanism for repayment, since many other taxing mechanisms could be used by the community. The property tax impact is given as an example and also because it is a repayment method often chosen by communities in the region. The annual operation and maintenance cost for the community is also included, and the revenue for this must be derived from a form of user charges and not from a general revenue source. The "average annual cost" represents the average annual debt service cost over a 20-year bond issue amortized at 6% and is the figure discussed in Part II, Section 2. The "tax rate impact" shows the annual change in the community's tax rate due to the debt service cost. The "operation and maintenance" figure is the annual cost to the community and would be

The average annual cost would be \$2,200 for Wayland, (not including stormwater costs), and this would result in an annual impact on the local tax rate of \$0.01. The annual operation and maintenance cost would be \$15,000.

II. ENVIRONMENTAL IMPACTS

A. Erosion Impacts. In examining the possible effects on erosion of the water quality recommendations for Wayland, there appear to be slightly negative impacts. Potential erosion problems could occur in areas of steep slope, erodible soils, or sparse vegetation.

Different effects would result in those areas where the density of permitted development would be reduced, so as not to conflict with the environmental capability of the land. Potential erosion problems would be reduced in these areas, and this would be a positive effect of long-term consequence.

The amount of potential erosion areas affected by the recommendations in Wayland appears to be approximately 10 acres.

Any 201 facilities planning studies done should analyze in detail the potential impacts on erosion-prone areas. Mitigating actions should be designed to reduce any negative effects.

B. Flood Control Impacts. When assessing the potential effects of the recommendations in terms of potential flood control problems, it appears that slight impacts could result. Lands with potential flood control problems are considered to be wetlands, flood hazard areas and steep slope areas.

The extended use of the wetlands district would have a positive effect on flood control problems. This regulation would serve to reduce or prohibit development in significant areas which have potential flood control problems. This benefit would continue as long as the regulation remained in effect.

The extent of the flood control problem areas appears to be 130 acres in Wayland. More detailed review of these impacts should be addressed in any 201 facilities planning and preferably should be reviewed in an environmental assessment done concurrently with the facilities plan.

C. Groundwater Impacts. The wastewater solutions recommended for Wayland appear to have slight impacts on potential groundwater supplies, as indicated by areas of high groundwater favorability.

Positive effects on groundwater could accrue in areas where groundwater favorability coincides with recommended environmental zoning districts, such as aquifer protection and wetlands districts. Because these environmental districts impose special constraints on development, they function as groundwater protection. By minimizing any construction activities in these areas, the land left in its natural state would maximize the infiltration and replenishment of groundwater. The positive effects on groundwater would con-

tinue for as long as the environmental districts are in force. Another potentially positive impact would result from the implementation of land management controls. Revised land use controls would mean more clustering and lower residential densities than what presently exist, thus enhancing the potential for more infiltration and recharge to the groundwater. It would be a long-term effect, lasting for the duration of this development pattern.

Detailed analysis of the potential impact on areas of groundwater favorability and recharge areas should be done as part of any 201 planning for the community. To fully assess these impacts, the environmental assessment should be done concurrently with the 201 planning.

D. Wildlife Impacts. The areas of potential wildlife habitat which possibly could be affected by the anticipated future growth in Wayland constitute a significant amount of the habitat areas which are currently available in the community. A prime factor in determining the capacity of wildlife habitat is the relative presence of suburban development in the area. The continuation of growth as low to moderately low-density type of development which has been occurring up to now means that urban development is dispersed across the community. One result of this dispersed-type of growth is that some urban development appears in all of those areas rated as potential wildlife habitats at the present time, and reduces their capacity to provide habitats. The potential impact on wildlife habitats could produce a negative impact on wildlife which would be of long-term consequences. Primarily, this can be viewed as a local impact.

The use of the wetlands district in Wayland would provide a benefit for wildlife. The development constraints imposed by this land-use regulation would provide local benefits for as long as the regulation was in effect.

The amount of potential wildlife habitat in Wayland appears to be about 2800 acres.

E. Air Quality Impacts. It is anticipated that the growth patterns projected as a continuation of existing trends would have a negligible impact on air quality.

III. SOCIAL IMPACTS

A. Open Space and Recreation Impacts. Generally, impacts on public and semi-public lands in Wayland would be minimal with development according to current trends. Much of the anticipated development which is located adjacent to or surrounding open space would be in areas zoned low to moderately low-density development. Development of this density could result in more use of existing open space and recreation areas by the residents.

In Wayland, a few scattered public and semi-public lands fall within recommended environmental zoning overlay districts. The additional development constraints contained in these wetlands or watershed protection districts would enhance open space or recreational areas and would therefore be a positive impact on such areas. These impacts would continue as long as the overlay districts remain in force and would be an impact of local significance. In the case of these overlay zoning districts, there is a strong positive relationship between this short-term use of the manmade environment and the enhancement of the long-term productivity of the environment.

In several places in Wayland where open space could be affected by development the recommendations have outlined possible zoning changes. In most instances, such changes would mean that areas currently zoned for moderate residential density development would become zoned for low to moderately low-density residential development. Impacts on open space would be minimized through the development of less intensive land uses and would be more compatible with open space.

However, it also should be noted that where the permitted residential density would be decreased according to the land development controls recommended, more land would be required to accommodate projected residential growth. The result could be less open land for passive recreation.

B. Archaeological and Historic Impacts. A review of the potential impacts of the recommendations on existing archaeological and historic sites in Wayland indicates that the growth pressure would create negative impacts on only a few sites. These few sites are either available for development, or they are adjacent to such undeveloped areas. Certainly when a site is actually developed, the impact is significant and long-term, and the commitment is irreversible. The loss of any of the archaeological or historic sites would be regional in significance.

In addition to the future growth pressure on archaeological sites, the recommendations indicate a potential positive impact on a few of the sites. These are located within environmental zoning districts, such as wetlands and aquiferprotection districts. The provisions of these districts act as development constraints, thus giving additional protection to the archaeological sites.

It should be noted that the specific names and locations of the affected archaeological sites are not included in this discussion. This has been done purposely in order to avoid unauthorized individual exploration of the sites. The information used was made available to this project from the State Archaeologist's Office with this request.

As the community undertakes 201 facilities planning, specific attention should be directed to possible effects on archaeological or historic sites and should be addressed in the environmental assessment which should be done concurrently with the facilities plan.

C. Housing Impacts. There is little overall difficulty in accomodating the anticipated residential growth in terms of the amount of land available in the community. The projected 1200 housing units anticipated for Wayland means that about 1400 acres of residential land will be developed over the 20-year period.

Wayland allows significant amounts of low density development. Since the cost of land is a significant factor in the total cost of housing, and obviously, the land cost factor is directly related to the amount of land required for each housing unit, this type of zoning could increase development costs. Information from the Greater Boston Homebuilder's Association indicates that a house lot of roughly one acre costs between \$17,000 and \$22,000 in the Boston metropolitan area. Therefore, a relatively low density pattern of residential development in this town may produce a negative impact on housing in terms of cost.

This negative impact on housing costs can be viewed from a regional as well as a local perspective, and at the regional level the potential problem becomes more apparent. While the cost of housing may be increased due to the relatively large lot sizes required, the effects may not be most distinctly felt by residents in the community. The lot size requirements and the concomitant land costs may well create a barrier at the regional level for full access to housing opportunities in the area for residents from throughout the region. This negative regional impact would be long-term in its duration.

Furthermore, the outlined environmental zoning districts, which would either prohibit or constrain housing development occur throughout the community and reduce the amount of land available for development. The community appears to be experiencing significant growth pressure and the reduction of land available for development would serve to intensify this pressure.

The land development recommendations for zoning changes should reduce current residential densities so as to preclude conflicts between zoning and environmental capability. The impact on housing could be an increase of the land necessary for the use on residential on-site disposal which would increase housing costs.

These factors would combine to affect a considerable amount of land, and thus reduce construction opportunities. There would be long-term implications, both locally and regionally. With more extensive use of protective districts in parts of the town, and the concomitant higher costs associated with larger lot requirements, access to housing opportunities for middle-income families may become even more difficult.

(Measures can be taken by the communities to mitigate any negative impacts and to help meet the region's need for additional housing. Some 362,460 residential units of all types will be needed by the year 2000 to meet the needs of new households and to replace existing units. Communities can permit moderately higher densities in those areas where negative water quality impacts would not result. Communities with sewers and those undertaking 201 studies can plan for higher densities in several areas. Limited use of package treatment plants can offer an opportunity for accommodating moderate density housing in selected areas of town. Also encouraging the use of cluster and planned unit development in a community can provide an opportunity for meeting a variety of housing desires while still protecting water quality related lands. In addition, a community can use existing buildings to increase the supply of moderately-priced housing by converting large dwellings into two or more units or reusing public or commercial buildings for housing, while maintaining adequate wastewater disposal facilities.)

IV. ECONOMIC IMPACTS

A. Manufacturing Impacts. Wayland has little water-intensive manufacturing employment, and will have few such jobs even by 1995. Therefore, water quality recommendations would have little impact on manufacturing activities in Wayland.

